RHODESIA

REPORT OF THE SECRETARY FOR AGRICULTURE

for the period

1st October, 1964 to 30th September, 1965

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REPORT OF THE SECRETARY FOR AGRICULTURE

(which includes the Economics and Marketing Branch, Co-operatives and Loans Branch, the Departments of Research and Specialist Services, Conservation and Extension and Veterinary Services).

FOR THE PERIOD 1st OCTOBER, 1964, TO 30th SEPTEMBER, 1965.

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Report of the Secretary for Agriculture
for the period 1st October, 1964, to 30th September, 1965

There are two factors which are of major importance in determining the problems that must be faced by both the Rhodesian agricultural industry and the Ministry of Agriculture in any one season: these are the weather and the buoyancy or depression of world export markets. Each of these can do so much to ease or complicate the tasks of farmers and the Ministry that it is appropriate to survey briefly at the beginning of this report the seasonal and export conditions prevailing in the period under review.

THE WEATHER

Climatically the 1964–65 season was a poor one for agriculture, although its early promise in some areas was excellent. Except for isolated showers in October and November the beginning of the season was dry and hot, and widespread and soaking rains did not occur until December. In parts of Fort Victoria and the south falls were extremely severe and in the comparatively short time they continued caused damage to conservation works within the area. In Victoria, Matabeleland, the Midlands and in the Sabi Valley the rains came to an end early in January, which led to one of the worst droughts experienced in the history of these areas. Elsewhere, over the northern parts of Mashonaland and the better watered areas, sufficient rain continued to fall to give promise of bountiful crops of maize, groundnuts and certain legumes, but the early promise was never achieved due to the cessation of the rains in February.

Its Effects

As a result of these conditions cattle producers in the Lowveld and Midlands areas were badly hit, especially as the previous season had also been a difficult one climatically. Cattle producers, especially those in Matabeleland, were forced by the conditions to sell their cattle at lower weights and grades than is normally possible—this applied almost exclusively to cattle sold off the veld and not to the higher grades of cattle. Also, because of the inadequacy of the grazing, larger numbers than usual were sold, although slaughterings did not quite achieve the record established in the previous season.

In February the seriousness of the situation caused the Minister of Agriculture to reconstitute, from previous years, the Matabeleland Drought Relief Committee and to extend its activities to all drought affected areas. This committee was chaired by the Director of Conservation and Extension. Then in March, with the situation becoming increasingly grave, and on the direction of Cabinet, a National Drought Committee was set up under the chairmanship of the Secretary for Agriculture. Its functions were to review the situation resulting from drought conditions, to receive and consider the problems from the previous-mentioned committee and to advise Government of all measures necessary, both short term and long term, for the relief of drought. Both committees were very active during the following months, their activity resulting in many forms of aid and other arrangements being made to alleviate the plight of drought-stricken farmers, not only to assist them in maintaining breeding stock but also to facilitate the movement of cattle from African and European farms and ranches and Tribal Areas for placement elsewhere. The committees were also instrumental in obtaining extended loan facilities for drought-stricken farmers and special income tax concessions on income derived from forced sales of stock. Aid was arranged, too, for drought-afflicted Oriental tobacco growers, stockmen and dairymen.

The effects of the season were possibly less depressingly spectacular on crops than on cattle, except in specific areas; they were, nevertheless, bitterly disappointing. In mid-season, hopes were high that grains and groundnuts would yield much better than usual, because of increased plantings of improved grain varieties and much expanded loan issues to African farmers for fertilizers. The European maize crop, in particular, promised a record output and even at the end of February a 6–8 million bag crop was being forecast. This, together with anticipated larger than usual sales from African areas, would have given an export surplus of up to 4 million bags—very close to the record achieved in 1960–61 for exports from Northern and Southern Rhodesia combined. Sales of groundnuts, too, were expected to achieve their own record—in the region of 400,000 bags.

Crops of this size would have provided a most welcome boost to the country's economy and to its export earnings. They would also have been an encouraging reward to farmers and to the Ministry of Agriculture for the really strenuous efforts which had been made to raise agricultural production. But the sudden cessation of the rains changed the picture completely and proved yet again how dependent farming is upon the weather, no matter how strenuous the efforts made by the producers and by research workers to find new varieties and improved techniques of production.

Sales of maize to the Grain Marketing Board, at the time of writing this report, were expected to be of the order of 3.6 million bags, an amount which allowed for a small over-the-border export but for no

overseas sales. In fact, arrangements had to be made for the importation of a quantity of yellow maize from South Africa.

The groundnut crop was even more disappointing and promised to reach little over one-third of earlier anticipations, the lowest sales to the Grain Marketing Board for about five years. The season, however, was not the sole cause of the small groundnut sales. The seasonal effects were accentuated by another factor, i.e. the introduction of strict controls for aflatoxin control which necessitated labour and time consuming sorting to exclude mouldy nuts. So that while at one time an export surplus had been hopefully anticipated, actual production will nowhere near meet our home demand.

This depressing story was similar for grain sorghums. Only about half of the sales forecast in March are likely to be realized, which is equivalent to about half the 1963–64 sales and which again will result in the necessity for larger imports than in the preceding year.

Fortunately, the season affected other important crops less seriously. The weight sold of Virginia flue-cured tobacco and Burley tobacco were of the order expected. Cotton sales, too, continued to expand rapidly and, at 40 million lb., were nearly treble the 1963–64 sales. Although quality was affected by the drought in some instances, this was not serious overall. Sugar also, because produced under irrigation and because of its consequent freedom from the effects of inadequate rainfall, continued its spectacular expansion.

World Market Effects

Dealing now with the effects of world markets on our main export commodities: maize and groundnuts, as explained earlier, did not feature to any significant extent in overseas markets. Hence our more important agricultural products affected by world conditions were Virginia flue-cured tobacco, sugar and beef.

Virginia flue-cured tobacco is still our most important single export commodity by far, but even though the quantity sold was of the order asked for by the leaders of the industry, it realized a somewhat disappointing average price of 32.96d. per lb. Happily, this was considerably higher than the disastrous prices of the previous season. It was, nevertheless, lower than in any of the years from 1957 to 1963 and by a coincidence was exactly the same as the average price realized for the 1956 crop. It is worth making the point here that there can be few major export commodities in the world today which are now cheaper than they were eight years ago. This comparatively low average price, however, was not due to low quality. On the whole, the crop compared very favourably in this respect with other years and the cause must be sought elsewhere. One possible explanation is that demand is switching from the higher to the lower grades of tobacco and this is being reflected in a drop in price in the upper grades.

The year under review was a disastrous one for world sugar prices. A year to eighteen months earlier the price had exceeded £100 per ton, c.i.f. London, but it slumped speedily during the year and at the beginning of September, 1965, reached the remarkably low price of £17 15s. 0d., which must have been well below the cost of production of a number of exporting countries. Fortunately for Rhodesia's sugar producers, a large proportion of their exports were sold under quota agreements at higher than world free market prices to the United Kingdom and the U.S.A. But the low free world market prices prevailing during the year must serve as a warning to the rapidly expanding sugar industry that, with increased production, the resultant increase in exports will cumulatively lower the average price received, unless Rhodesia's quotas in the higher priced markets can be enlarged. However, by the end of September the price was rising again, although slowly, as a result of the Indian/Pakistan military operations.

The bright spot in world markets as far as Rhodesia was concerned was beef. Demand continued at a high level in Europe and the prices realized for Rhodesian carcases were considerably higher than those achieved in recent years. Although the drought reduced the number of heavy, well-finished carcases available for Smithfield market in the first six months of 1965 it did not affect supplies of the leaner type carcases demanded in other European markets. Rhodesia's difficulty in 1965 was that it had insufficient supplies to meet demand. However, as a result of smaller quantities of beef being sent to the Congo, the exports to overseas markets showed an encouraging increase and a feature of the year was the much larger exports to Italy and Switzerland. Exports to the latter country are sent by air and by June, 1965, over 13 tons of chilled beef were being exported in this way weekly.

At the time of going to press it was too early to compare figures of the value of agricultural exports for the whole of 1965 with those for 1964. The situation appeared encouraging, however, for the first six months of 1965, since the value of the three main export commodities—Virginia flue-cured tobacco, sugar and beef—exceeded by £3 million the value of these commodities in the comparable period of 1964. Although this does not necessarily mean that this position will be maintained for the year as a whole it does give reason to hope that in spite of a bad drought year the agricultural industry will continue to provide over 35 per cent. of all Rhodesia's exports as it did in 1964, and thus remain as one of the country's main foreign currency earners.

A similar hope can also be entertained for agriculture's total production. Over recent years the gross domestic product of agriculture has continued to increase, but since 1961 at a slow rate roughly in line with the rate of increase of the economy as a whole. In 1964, on the other hand, it jumped by over 6 per cent. as compared with a rise in the national gross domestic product of only 3.7 per cent. Thus, agriculture's share of the total rose to 21.1 per cent., the highest since 1956. The year 1964, too, was not particularly favoured climatically so that there can still remain some reason for optimism regarding 1965 and if the weather in future years can break out of the "drought-cycle" which seems to have beset the country in the immediate past agricultural production should show a highly significant advance.

MINISTRY STAFF PROBLEMS

The previous ten months, December, 1963, to September, 1964, had been difficult ones, as reported in this Ministry's Annual Report for 1963–64, although by the end of the year the Ministry had settled down and was functioning as a cohesive unit.

Even at the beginning of 1965, however, there still remained certain influences which were tending to cause individual dissatisfactions. There were still outstanding items regarding certain gradings within the Ministry, the grading and conditions of service were considered by no means satisfactory, and, because of Government's financial position, the mileage allowance for field staff was severely restricted. These matters were being resolved, however, by the end of the year.

Inability to recruit sufficient staff caused concern for a great part of the year, due in large part no doubt to the political uncertainties which prevailed during this time and to improvements in conditions of service in other competing countries. The only two branches which did not share in these difficulties were the Economics and Markets Branch and the Co-operatives and Loans Branch.

The situation of shortage was made worse by the steady trickle of officers leaving the service, some of whom were ex-Federal officers who had been on provisional transfer conditions and who had been looking around for better opportunities, or who had been making up their minds whether to remain in Government service or not. For one reason or another, however, the Ministry lost some highly experienced officers during the year whom it could hardly afford to lose and whom it will find difficulty in replacing.

The situation brightened to some extent towards the end of the year when Government authorized the engagement of officers on contract terms. Many vacancies were filled on this basis and in some departments, notably Conservation and Extension, the situation had so improved by the end of September that only consequential vacancies remained to be filled. This system of engaging on contract terms carries within it, however, certain dangers. Unless salary and grading conditions are kept in line with similar posts in other parts of the world it is quite possible that in about two years time, when contracts expire, the Ministry will be faced yet again with a considerable exodus of experienced officers.

The cause for the Ministry's greatest concern as regards staff was the inability to recruit professional officers. Throughout the world there is a general shortage of professional men, which means that those having adequate qualifications have a wide choice of posts and countries from which to choose. It means also that any country looking for staff must, therefore, offer salaries and other conditions of service comparable with those offered elsewhere.

There is no doubt whatsoever that the salaries and conditions of service now offered to professional officers here do not compare favourably with those offered overseas and even to the north of us. This factor has made the attraction of officers to Rhodesia extremely difficult. The point being made here is that salaries and conditions of service in this country need to be adapted to suit the particular needs of professional men. Many of the departments into which they are expected to move are small—in many cases the job is so specialized that there is only one man—which eliminates any possibility of promotion except into an administrative post. What is needed, therefore, are long salary scales in which an officer can make his career, better opportunities for study here and overseas, adequate working facilities, e.g. laboratories, and sufficient financial recognition for higher qualifications. Without these inducements new people will not come here and many of those already here may go.

A measure of the seriousness of the situation is that the Department of Research and Specialist Services has vacancies for 30 technical and professional officers which it is unable to fill, in spite of three separate recruiting tours made this year by three of the department's more senior officers overseas and to South Africa. The Department of Veterinary Services is in a similar position, although the shortage was relieved somewhat towards the end of the year by the appointment of officers on contract terms.

What must be obvious, however, is that with such serious shortages existing in vital branches of the Ministry the services offered to the agricultural industry will inevitably suffer. Research cannot be allowed to fall behind. Moreover, if the work of the Veterinary Department cannot be maintained at the level required by international standards our export beef industry could well be put in jeopardy.

Government policy continued during the year to emphasize the need for maximum effort in the African areas in order to speed the emergence of the subsistence sector into the cash economy. To meet this need this Ministry changed its emphasis in its extension work so that roughly two-thirds of conservation and extension officers' time was devoted to the African areas and one-third to the European. This change not only necessitated a major redisposal of field personnel but it also placed an increased area of responsibility on the personnel remaining in the European areas. Whereas, before the amalgamation of the Federal and Southern Rhodesian Ministries of Agriculture, each conservation and extension officer in European areas was responsible, as a broad general rule, for one I.C.A. area, many now were expected to deal with two, or sometimes as many as four. This, in conjunction with reduced mileage allowances, previously referred to, placed a strain upon the ingenuity and abilities of the officers concerned.

A growing number of Africans are now emerging from Chibero College with agricultural diplomas and this, coupled with the increasing emphasis being placed on the development of African areas, has allowed this Ministry to appoint six African conservation and extension officers—on the same salary scale and conditions of service as other conservation and extension officers—for work among African farmers.

The Ministry has also continued to develop the concept of a unified service within one Ministry for both the Farming and Tribal Trust sectors and by the end of September all provinces were operating on this basis.

AFRICAN AREAS

Combined with the efforts mentioned above the Ministry of Agriculture also did its best in other spheres to implement Government's policy of raising standards of production and living standards in African areas. Notably, it put a great effort into expanding the Co-operative Movement and to lending as much money as possible through the Agricultural Loan Fund (with due regard to recovery), since both of these spheres of activity impinge directly on the farmer's ability to increase his production and to obtain the best price possible for marketed produce. More will be said about both of these activities later; it is sufficient to point out here that, as a result of the efforts made, the number of African Marketing and Agricultural Supply societies increased from 110 at the beginning of October, 1964, to 166 by the end of September, 1965, and on the loans side loan approvals made for the year ended September, 1965, totalled £270,700.

MARKETING AND PRICING

During the year several important developments occurred in the marketing and pricing of agricultural products, some of which raised issues of widespread interest, not only to producers but also to the public and industrialists at large.

Recognizing the opportunities waiting to be exploited in the world beef markets, and in an effort to go some way towards meeting that demand by increasing exports of Rhodesian beef, the Minister, after consultation with the Rhodesia National Farmers' Union, awarded an overall average increase of 10s. per 100 lb. c.d.w. on the guaranteed producer price of cattle, with effect from 1st January, 1965. It was hoped that by thus making beef production more profitable there would be an upsurge in production.

Unfortunately, the drought masked the good effect this might have had. As explained earlier beef sold off the veld realized lower weights and grades than would normally have been possible and producers, particularly in Matabeleland, found themselves with lower realizations.

The drought had one further unforeseen effect. Because of the lower weights and grades of cattle marketed, the Cold Storage Commission paid less for its supplies than it had expected. Its export realizations, on the other hand, were much higher than in previous years. So, combined, these two situations resulted in a quite unexpectedly high profit accruing to the Cold Storage Commission, higher in fact by £400,000 than had been anticipated, and at £887,723 a record operating profit for all time. This in itself posed problems. For the Cold Storage Commission to make record profits in a year when many producers were suffering hardships seemed quite illogical, and resulted in demands for some of the profits to be passed back to producers. Ways and means were considered of how the plight of the Matabeleland producers might be alleviated out of the funds, but the suggestion of a bonus on their slaughterings had, unfortunately, to be rejected as being inequitable. Other producers who had already disposed of their cattle elsewhere would quite legitimately have had cause for complaint had such a bonus unexpectedly been announced.

The Cold Storage Commission had also to bear in mind that any increase in price it agreed to would have to be related to the realities of what it could afford to pay in future, in more usual years. And the alternative proposal had also to be considered, that the windfall profits should be set aside to help finance the very considerable capital expenditures which the Cold Storage Commission anticipated in view of the expansion expected in the beef industry.

However, the high prices being paid in overseas markets and the bright propects for beef in the immediate future, in Europe and elsewhere, could not be denied. In these circumstances an incentive price to

encourage increased production seemed a sound principle. Just what the increase should be was a matter for discussion. And this point, together with consideration of revisions which might conveniently be made at the same time to the grading system of cattle to more adequately meet market requirements, was under discussion amongst officials of the Ministry and producer representatives at the time of going to press.

The second major commodity to come under review during the year, in respect of its pricing and marketing policy, was maize. For some time the Rhodesia National Farmers' Union had been pressing for a more long-term pricing policy, to replace the negotiations which had taken place in recent years on an annual basis to set prices for the ensuing harvest. Several propositions were discussed during the year and at the end of September a firm proposal had been put to the Rhodesia National Farmers' Union on the basis that for the coming harvest and the two following seasons Government was prepared to agree to a system under which, in the fixation of the producer price, the calculation should be based upon the Grain Marketing Board's internal selling price of 41s. 9d., less the Board's costs, with the producer getting net realization for any export maize, and no subsidy being contemplated. This last-mentioned proviso was in line with Government's attitude towards the subject of agricultural subsidies generally, but was an innovation as far as the maize price was concerned. The Ministry, however, was willing to review the situation annually to take into account all relevant changes in circumstances, including such factors as adverse seasons, movements in the price of the bag, cost of input items and market prospects. It was expected that these arrangements would be acceptable to the Rhodesia National Farmers' Union, but formal acceptance by them was awaited at the end of September.

The internal marketing arrangements for maize and other controlled grains also came under review during the year. This was directly as a result of the Grain Marketing Board's growing concern over the black-marketing activities in maize, which seemed to be increasing. The Board's concern was due to the fact that the black market prejudiced producers by reducing local sales through the Board at high internal prices and so reduced the pool price payable to producers. The proposed solution was that Rhodesia should be divided into two areas of control. In the one, the marketing of grain would be conducted solely through the Board; this area would embrace the commercial producing areas of European land and African Purchase Areas, together with the main consumption areas. Here, no producer would be permitted to sell his products to anyone other than the Board and no consumer would be permitted to buy except from the Board. In the remainder of the country—mainly Tribal Trust areas—free trading would be permitted. Removal of controlled grains and products from this area into the first area, however, would only be permitted through buyers approved by the Board, registered producers and co-operatives. These proposals were still under consideration at the end of September, 1965.

The problem of pricing and marketing which caused probably the most widespread interest and lively discussion in 1965 both inside the industry and outside it, amongst industrialists and the general public, was that concerning skimmed milk powder. This was only one aspect of the plight in which the dairy industry found itself during the year but Government's action in dealing with the problem had widespread repercussions.

The main factors involved were:

1. Despite declining profit margins of milk production generally, the quantity of milk produced continued to increase.

2. The amount of whole milk consumed was roughly static, hence the amount of milk being sold for industrial purposes was increasing, and this was having a depressing effect on the pool price payable to producer.

3. The Dairy Marketing Board was operating the whole milk pool at a loss, which was borne by Government, and Government wished to do away with this subsidy.

It was fully realized that if the subsidy was to be withdrawn entirely there seemed few alternatives but to increase the consumer price of milk or to decrease sharply the producer pay-out. Government was anxious to avoid both these consequences. It had therefore made an interim arrangement in July, 1964, to cover the twelve months ending 30th June, 1965. The main features of this arrangement were as follows:

(a) Extension of the Milk Prices Agreement until the 30th June, 1965.
(b) Producers to receive 46.5d./gl. for all milk sold as whole milk plus an annual amount of 750,000 gallons.
(c) Payment of a Good Quality Premium on all milk delivered which met the requisite standards.
(d) Producers to receive a guaranteed price of 22.2d./gl. for all milk delivered in excess of that used for whole milk plus 750,000 gallons.
(e) The Dairy Marketing Board to increase its wholesale selling prices of roller and spray dried skim milk powders to 1s. 3d. and 1s. 9d. per lb. respectively.
(f) The Board to be granted the sole importing right for skimmed milk powder in bulk and at the same time to withdraw from the repackaging trade in this product.

(g) The retention by the Board of profits made on the sale of dairy products after the payments of the guaranteed price to producers of 22.2d./gl. These profits to offset the reduction in subsidy.
(h) A reduced subsidy commitment of £51,000 by Government payable to the Board.

Due to the hardening of prices of spray dried skimmed milk powder on the world markets the anticipated level of profit made by the Board on imported powder did not materialize and, whilst it is expected that the Board will show a small profit for the year ended 30th June, 1965, such profit was of little consequence in relation to the accumulated losses of the Board.

Against this background Government representatives met with representatives of producers on several occasions during the year to arrive at pricing and marketing arrangements for the future. It was eventually agreed that such arrangements for the twelve-month period ending 30th June, 1966, would be as follows:

(a) Producers would receive 46.5d./gl. for all milk sold as whole milk. In the event of whole milk sales during 1965–66 falling below the 1964–65 level, producers would receive this price for milk up to the 1964–65 level.
(b) The payment of 46.5d./gl. on an additional 750,000 gallons per annum was discontinued.
(c) Producers would continue to receive a Good Quality Premium but the total figure for such payments would be limited to £110,000 for the year.
(d) In place of a guaranteed price for milk in excess of whole milk requirements producers would receive the full net realization value for such milk.
(e) The subsidy payable by Government was withdrawn.
(f) The price of whole milk to the consumer was raised from 8d. to 9d. per pint.
(g) The Board would continue to be granted the sole importing right for skimmed milk powder in bulk.

Government was extremely worried at the cost of skimmed milk powder to consumers, particularly those in the lower income groups, who had been most affected by the increase in price. This increase and the fact that the D.M.B. had been selling the powder in minimum lots of one ton, in order not to interfere in the province of private enterprise, were the cause of an upset, particularly among social welfare organizations who could not use as much as one ton at a time. Representations were made that the minimum lot should be reduced from one ton to 50 lb. There was considerable opposition to this from private enterprise who regarded such a change as constituting undue interference in their field, and representations were made to the Ministry by the Associated Chambers of Commerce of Rhodesia.

Eventually Government made a compromise which was to endure until a report was received from a working party it set up, under the chairmanship of Mr. R. Williamson, O.B.E., to consider the whole position of the dairy industry. The compromise was that the Dairy Marketing Board should continue to sell skimmed milk powder at 1s. 9d. per lb., it should reduce its minimum lot from one ton to 50 lb., and that it should make available at its depots skimmed milk powder in polythene bags in 5 lb. lots at 1s. 10d. per lb.

The report of the working party has not yet been received.

Another product for which significant pricing arrangements were discussed during the year was groundnuts. This crop is grown predominantly by Africans and in the past two or three years has been their most important cash crop, without any doubt. The volume of groundnut sales had been increasing encouragingly but during the 1963–64 season it was adversely affected to some extent by not particularly favourable climatic conditions. The drought in the year under review was the second unfavourable season in succession and it proved a severe setback to the crop. In addition stringent regulations had perforce to be introduced by the Grain Marketing Board at the request of this Ministry, to reduce the risk of aflatoxin infection, to exclude mouldy nuts from the groundnuts presented for sale. These two factors resulted in very much reduced sales and at the end of September it seemed possible that they would amount to no more than 135,000 bags as compared with an estimate in April of 320,000. Recognizing the importance of the crop to African producers and wishing to maintain producers' interest in the crop the Ministry gave serious consideration to proposals which might prove of value in this respect. It was in favour, for instance, of raising the price of grade "A" nuts and widening the gap between the prices of the "A" and "B" grades as some compensation to producers for the time-consuming effort involved in sorting for mouldy nuts. At the end of September these proposals were well on the way to being accepted and acted upon.

The marketing prospects, specific marketing problems and the prices of many other crops were also investigated during the year, in particular wheat, cotton, citrus, deciduous fruit, soya beans, tea and coffee. The topic of greatest and very real concern to all growers of flue-cured tobacco during the year was whether the crop should or should not be controlled in future. This concern arose out of the record crop and devastating drop in prices which had occurred in the previous season. The Rhodesia Tobacco Association therefore propsed that all producers should take part in a referendum on the subject. And prior to this referendum being held a committee was formed, under the chairmanship of Mr. J. A. Clark, to evaluate the pros and cons of control and to present an appraisal to growers to help them fully appreciate the issues involved.

Two officials of the Ministry were invited to serve on this committee in their personal capacities and the Ministry gave evidence before it. It is of interest to note that growers eventually voted by a large margin against control of the crop and in favour of a continuation of free production and auctions but opted to exercise self discipline in production under the guidance of the industry's leaders.

CO-OPERATIVE MOVEMENT

While on the subject of marketing, it is appropriate to deal in more detail now with the co-operative movement. The Ministry has always regarded this movement as one of the most promising means of stimulating development in the African areas, since it is by co-operative marketing that the very best prices can be obtained for members' produce. Grading is properly carried out, members are taught the value of grading, and transport and handling costs are reduced to a minimum. In addition, co-operatives provide a convenient channel for the distribution of production loans and, equally important, for the collection of loan repayments. They also offer members facilities for purchasing farm requisites at favourable prices. Thus, co-operatives are an invaluable complement to the extension services, one service concerned with improving production techniques and the other with ensuring that the commodities produced find markets at attractive prices. The success of one affects and stimulates the other. For these reasons the Ministry has given the greatest encouragement to expansion in this field and this past year has seen some remarkable developments, for which the staff of the Co-operative and Loans Branch should be given full credit.

Earlier in this report a brief reference was made to the rapid expansion which took place during the year in the number of co-operative societies formed. More detailed information on other aspects of the expansion may be found in the report of the Under-Secretary, Co-operative and Loans Branch, (see page 15) but there are one or two fundamental aspects which merit stressing here. The stage of development in the co-operative movement has now been reached when 1966 should see a move made into the formation of secondary societies at regional level, i.e. a number of co-operatives which up to the present have operated on an individual basis are now in a position to form a parent body, which would service supplies to primary producer co-operatives and provide a central book-keeping service. This would be a significant advance for the movement.

That is for the future, but in the immediate past advances in other directions have also been made. An education programme was started during the year, with courses at centres such as Alvord Training Institute, and these proved both successful and popular; educational tours were made of the Cold Storage Commission, the Grain Marketing Board, and the cotton buying depot at Gatooma and these visits cleared up many misunderstandings, resulting in improved marketing by societies, particularly of the higher grades of cattle; three tractor units were formed, in which tractors owned by the co-operatives did work for members on a contract basis—these were working successfully by the end of the year and should provide invaluable experience and data on which other similar units can be formed in areas where private enterprise is unable to provide a service. July, 1965, also saw the approval of five new co-operative regions: staff are now in training and offices should be in full swing by March, 1966. In all existing regional offices women clerks were appointed during the year. Their services have proved invaluable, not least in releasing co-operative officers from office work and allowing them more freedom for co-operative extension work in the field.

Finally, mention must be made of the high standard of cotton marketed through co-operatives. This was highly gratifying to both the Ministry and the Grain Marketing Board. And a further development in this field is that there are now many cotton spraying units in the Sabi Valley financed entirely from co-operative society funds.

AGRICULTURAL LOAN FUND

Besides efficient extension and marketing services, a third major requisite of success in the development of African areas is that producers shall have adequate capital with which to implement the advice given to them—it is useless being told that to achieve high yields one must apply given levels of fertilizer when one has no cash with which to buy it and no sources from which one can obtain loans. This, virtually, was the position in Tribal Trust Lands prior to the setting up by Government of loans schemes to cater specifically for the special needs of African areas. For the levels of production in these areas provided little opportunity for producers to set savings aside out of their incomes, they could not provide the normal type of security with which to obtain loans from commercial sources and hence they were committed to a vicious circle of low productivity, low incomes, no savings and so on. The first Government loans schemes were established, therefore, with the specific aims of catering for loans of very small denomination, made to borrowers scattered over a very wide area and on the basis of security dependent purely on local assessments of an individual's character.

From the beginning these schemes have grappled with the problem of how to ensure repayment of loans. In the early years District Commissioners provided a convenient and efficient channel of repayment, but with the transfer of the loans scheme from the Ministry of Internal Affairs to this Ministry in July, 1964,

the use of these facilities largely fell away. From the beginning of the year under review, therefore, the Ministry was faced with devising satisfactory debt-collecting machinery.

At the beginning of the year discussions were being held by the Treasury and other Ministries into the possibility of expanding the system of District Accounts Offices, which would have provided ideal media for the collection of loan repayments. It was obvious, however, that such a system would not be in operation on a wide scale before the short-term loan season commenced. A scheme was hurriedly put into operation, therefore, dependent on loan repayments being made through Post Offices. The glaring deficiencies of such a scheme were well appreciated, particularly the difficulty involved for those borrowers situated miles away, often in inaccessible areas, from a Post Office, and the complete absence of a "dunning" organization. It was initiated, however, purely as a stop-gap measure in the confident expectation that District Accounts Offices would be in operation by the time the mass of short-term loans fell due for repayment.

In the event, after months of discussion and despite frequent and urgent appeals from this Ministry for District Accounts Offices to be formed, the proposal was eventually dropped. This left this Ministry with no debt collection machinery at its disposal and the responsibility for ensuring repayment of thousands of pounds of public money. As the season progressed and drought affected wide areas, prospects in this respect became grave, for it was obvious that many borrowers, through no fault of their own, would be faced with complete inability to pay, because of crop failures, and that, in any event, large numbers of borrowers would need to be pressed vigorously for repayment.

It should be stressed here that the problem lay not with co-operative societies, where facilities existed for ensuring repayment, but with loans made to non-co-operative society members through District Loans Committees. At the end of the year under review it was too early to assess what the level of repayments would be. It is heartening to record, however, that as far as can be ascertained borrowers are making strenuous efforts to repay, money is coming in faster than had been anticipated earlier and all credit is due to the African producers who, under difficult circumstances, have attempted to meet their obligations to the best of their ability.

It was obvious, however, that this unsatisfactory system could not be allowed to continue in the future. A new procedure was accordingly devised for loans for the 1965–66 season. The bulk of loans were to be made through co-operative societies, where allocation and collection is relatively simple, and in other instances only to borrowers who are willing to sign a stop-order on their crop sales, at the time of the granting of the loan, and who undertake to sell through recognized traders. Exceptions had to be made in a few areas which were too distant from recognized traders to make the scheme workable. It is unfortunate that the loans scheme has had to be restricted so severely but there is no alternative while the country lacks an effective fund collecting agency in the Tribal Areas. The only mitigating circumstance is that the co-operative movement is now fairly widespread, is expanding rapidly, and can be expected to at least continue the recent rate of expansion as new regional offices begin to function.

AGRICULTURAL PRODUCTION COMMITTEE

On 9th April, 1965, the Minister of Agriculture announced the dissolution of the Agricultural Production Committee. This had been formed in September, 1963, charged with the responsibility for stimulating an increase in the country's agricultural output in order to assist the national economy. During the eighteen months of its existence, the committee's endeavours and the co-operation it had enjoyed from the Group Intensive Conservation Area and Regional Production Committees and from the farming community generally, had succeeded in creating the necessary awareness of the need to expand agricultural production in the country's economic interest and in firmly establishing that need in the minds of all farmers. The Minister was satisfied that, with the attainment of its objective, there was no further need for the committee to remain in being. It was therefore left to the machinery available in the Ministry, the Rhodesia National Farmers' Union, the African Farmers' Union, the Natural Resources Board with its I.C.A. organization and the Regional Production Committees to continue to build on the foundations of goodwill and interest which had been laid down.

RHODESIA FREEDOM FROM HUNGER CAMPAIGN COMMITTEE

During the twelve months under review, the Rhodesia Freedom From Hunger Campaign Committee continued to grow in stature under the chairmanship of Mr. L. T. Tracey, O.B.E., M.C. Through the medium of press, radio and television it has reached the public conscience in regard to the problems of malnutrition amongst the less fortunate sections of our community, and, more latterly, to hunger resulting from two successive droughts in the southern half of the country. When the committee was formed in January, 1964, hunger as such did not exist in Rhodesia and its principal task then was that of combatting the ignorance and apathy amongst the 450,000 subsistence families in the Tribal Trust Areas which is preventing them moving towards better farming, better feeding and better living. Projects, therefore, for which the committee was seeking overseas support at the end of last year, were of the long-term nature.

Starting three years behind the inauguration of the movement on a world-wide basis, has proved a handicap as far as projects considered for overseas fund-raising has been concerned. It was found that the United Kingdom campaign, with which the Rhodesian campaign committee is associated, had gone through its first flush of enthusiasm and its member committees were almost fully committed to projects they had undertaken throughout the world. However, of the submissions which were awaiting consideration at the end of last year, three were supported. Grants each of £10,000 were given towards the £20,000 scheme to provide six buses required to carry tribesmen to experimental stations, training courses and other educational objectives, and to a £15,000 project for the provision of six mobile agricultural training units. In both these cases the balance of funds required was obtained from the African Development Fund and Government sources. Both these schemes will be operational in the near future. The third grant was from the United Kingdom Women's Institute, who subscribed £9,000 to provide two Land-Rovers for the Federation of Women's Institutes to assist them in their educational work; the grant also took care of the running costs and maintenance for three years. This project has been functioning with great success since March, 1965.

Early in 1965 the committee became concerned about the food position in the drought-stricken areas of Matabeleland and, following consultations with representatives of the Ministries of Internal Affairs, Agriculture, Health and Social Welfare, it decided, albeit reluctantly, to shelve some of its long-term proposals in order to concentrate on the short-term problem of hunger amongst the children affected. With the unstinted co-operation of the Ministries of Education and Health and of the Missionary Societies concerned, it was decided to implement a supplementary feeding scheme for school and pre-school children through the schools in the districts of Gwanda, Matobo and Plumtree, the areas, in the estimation of the Ministry of Internal Affairs, where suffering was likely to be the greatest. A national appeal was therefore launched in June, known as the "Children of the Drought", to raise the sum of £66,000 to feed an estimated 40,000 hungry children. The Oxford Committee of Famine Relief, a United Kingdom organization, immediately responded by offering £15,000 if such a sum could be raised locally in Rhodesia. This amount was, in fact, quickly subscribed and subsequently the State Lottery Trustees offered up to £15,000 on a £ for £ basis for sums raised locally in excess of £20,000. By the end of September, local contributions amounted to £23,415 and the appeal totalled £41,830 with money still coming in. Special appeal committees set up in Salisbury and Bulawayo have done a wonderful job in this fund-raising venture.

On the ground, there have been some difficulties in getting the scheme started despite efforts of the campaign director and local church and civil leaders. A reluctance at some schools to start this scheme has been due, it is thought, to an inherent distrust to accept something new and unknown; at others there have been reports of intimidation by nationalist elements. As time goes by and the effects of the drought are being more severely felt, a few more schools are accepting the feeding scheme.

It has now become apparent that hunger is as bad, if not worse, in other drought-affected areas as in the three districts to which the scheme has been applied. As the year under review closed the committee were actively investigating the possibility of spreading the application of the supplementary feeding scheme to schools in a further eight districts, at least on a selective basis, depending on the numbers involved, and the availability of funds.

Pre-occupation with the "Children of the Drought" has not been permitted to interfere with the spreading of the campaign, and indeed it has given an added incentive to the formation of regional committees in centres throughout Rhodesia. These committees draw representation from all local voluntary organizations and public-spirited individuals. Each has as members local officers of the Ministries of Internal Affairs, Health, Education, and the Department of Conservation and Extension. Particular attention is focussed on the local need and the projects undertaken by these committees vary from the provision of skim milk powder at baby clinics to literacy classes for adults: from the raising of rabbits and the encouragement of fish farming to provide protein to the laying of a fresh water supply system to an African village. Additional regional committees are currently being organized.

On the 28th September, 1965, the first Annual Conference of the Rhodesia Freedom From Hunger Campaign Committee was held in Salisbury and was well attended by members of the national committee and regional committees. The chairman was able to state that the State Lottery Trustees had signified that they would be willing to accept for sympathetic consideration with a view to financial support, projects from regional committees submitted by them through, and vetted by, the national committee. This has proved a big fillip for these committees, who face a vast and often unrewarding task in the field.

The campaign in Rhodesia has met with a large measure of public support from all sections of the community during the past twelve months reflecting considerable goodwill and effort from all races. The foundations are now laid and the Rhodesia Freedom From Hunger Campaign can be expected to make a substantial contribution to the welfare of the less fortunate amongst our population.

Overseas Visits

Many officers of the Ministry were called upon to make journeys outside Rhodesia during the year in the course of their duties. The reports of the various departments within the Ministry, which follow, contain details of the journeys made by their own officers, but below is given a list of the more important trips made by the Minister and officers of the headquarters staff:

24th–29th January, 1965: Deputy Secretary (Economics and Markets) and Senior Agricultural Economist to South Africa to study the organization of various marketing boards and other marketing organizations.

21st February–31st March, 1965: The Minister and Deputy Secretary (Economics and Markets) to the United States of America for tobacco trade talks.

6th–11th April, 1965: The Minister and Secretary to the Rand Easter Show.

22nd May–3rd June, 1965: The Secretary to Rome and London on F.A.O. and other business.

2nd–19th June, 1965: Deputy Secretary (Economics and Markets) to Brussels for talks with officials of the European Economic Community, and to Spain on Export Promotion Council business.

11th–14th August: Secretary, Agricultural Marketing Council, to South Africa for talks on seed maize.

Deputy Minister

On 5th July, 1965, this Ministry was pleased to welcome Lance Bales Smith, Esq., M.P., as Parliamentary Secretary (later designated Deputy Minister), to assist the Minister of Agriculture. His range of duties covered all the agricultural technical services, including Research and Specialist Services, Conservation and Extension, Natural Resources Board, Department of Veterinary Services and Co-operative Societies and African Loan Funds.

Secretary's Retirement

Mr. C. A. Murray, O.B.E., retired as Secretary for Agriculture on 18th September, 1965, after 35 years' service with the Ministry of Agriculture. He first joined the Southern Rhodesia Government as Lecturer in Animal Husbandry at Matopos School of Agriculture in 1930, and subsequent appointments were Senior Animal Husbandry Officer in charge of Rhodes Matopos Research Station (1934), Chief Animal Husbandry Officer (1946), Assistant Director, Department of Research and Specialist Services (1948), and Director of Conservation and Extension (1950). He was appointed Secretary to the Federal Ministry of Agriculture and Chairman of the South Western Tobacco Marketing Board in 1960, and on the break-up of the Federation he became Secretary for Agriculture in the new Rhodesian Ministry of Agriculture in 1963.

Mr. Murray was the first Director of Conservation and Extension. He was therefore responsible for starting the Extension Service which is so successful today. Since his appointment as Secretary to the Rhodesia Ministry of Agriculture he showed a particular interest in bringing subsistence agriculture in this country into the money economy and was responsible on many occasions, for bringing this particular problem to the fore and for introducing ways and means of solving it. His enthusiasm and drive were well known and it was with regret that his many friends in the Ministry saw him leave Government service.

The Future

It was mentioned earlier in this report that all in the agricultural industry were looking forward to the weather soon breaking out of its sequence of drought years. Given reasonable climatic conditions there is no reason why this industry should not forge rapidly ahead; there exists a progressive and forward-looking body of farmers in the country anxious to increase production, who have the correct business approach to their farming problems; there exists, too, a vast potential in the African areas, and there are efficient Government services available to assist where needed. Market possibilities for many crops are bright, in particular beef for export, but the potential of Burley and Oriental tabocco and other crops should not be lost sight of. Therefore, it is with confidence that this Ministry looks forward to the future.

Acknowledgments

In conclusion I wish to acknowledge most sincerely the co-operation which this Ministry has received from a large number of bodies throughout the year—other Ministries, farmers and their many organizations, chairmen, members and management of the Statutory Boards, chairmen and members of the Freedom From Hunger Campaign, Drought Relief Committees, Agricultural Production Committee and the many other committees which made such valuable contributions to the agricultural industry.

Finally, my sincere thanks go to all members of the staff of the Ministry who worked so willingly and enthusiastically throughout the year.

R. A. GRIFFITH,
Secretary for Agriculture.

Economics & Markets Branch Report

For the period 1st October, 1964, to 30th September, 1965

The work of the Economics and Markets Branch can never be measured in so many practical achievements nor in a specific number of spectacular break-throughs. It is more concerned with exploratory exercises which form the bases for policy decisions or with providing background information to technical research workers, extension officers and farmers. Much of it deals with the economic implications of a whole range of propositions and schemes, from land settlement and irrigation projects to price and market proposals for particular products. And much, again, is concerned with the impact of international trade upon Rhodesia's import and export transactions. Its ambit is wide but so often it takes the form of providing one facet of a much larger whole that frequently it is difficult to do full justice in an annual report to the complete output achieved within a year.

There do exist, however, certain items providing concrete evidence of some of the ground covered. These are the reports prepared by the Branch's officers. Some are published, others are for use only within the Ministry. In the past year 23 such reports were prepared and these are listed later in this report. Their titles give some indication of the wide range of projects examined. This wide range is in itself an encouraging feature in so far as it reflects the efforts being made within agriculture to explore all means of diversifying farming systems and to assist farmers by market and cost and profit investigations to develop the full potential of their ecological conditions. Three of the reports were of particular interest since they concerned crops which have not been developed on a large scale in Rhodesia up to the present time, but which appear to have possibilities for expansion. They are wheat, coffee and tea.

In the report on wheat it was demonstrated that Rhodesia's winter conditions afford an ideal environment for the crop—but for the lack of rainfall. This can be overcome by growing in moisture-retaining soils or under irrigation. Furthermore, the highveld and lowveld winters are considered to be only marginally different climatically in their effects on wheat yields. There are, too, sufficient suitable soils in both the highveld and the lowveld to grow sufficient wheat for Rhodesia's needs. The main reason for the slow growth in wheat production up to the present time has been its comparatively poor showing as regards profitability in comparison with other winter crops such as winter potatoes, barley, and so on. But with the varieties now available it is not impossible for yields of 15 bags to be obtained under irrigation for an on-farm expenditure of £25–£31 per acre. Thus, at a price of 60s. per bag the crop can be quite an attractive proposition.

The prospects for coffee in Rhodesia were shown to be dependent on the production of top quality coffee demanding high management practices. The two main obstacles to its rapid expansion are the high capital requirements of the crop and the fact that a return on sales is not obtained until the fourth year. But once the crop is in full production in year six and onwards the returns are most attractive and the farmer is in a good position to make heavy redemption payments. Redemption is not, therefore, a major problem. The most important factors are the amounts of money which can be provided by the farmers themselves and the amounts that can be borrowed.

Similarly with tea, the main drawback to its expansion is the length of time required for the crop to reach full production and hence before any income is available—seven to nine years after establishing the nurseries. As a crop grown on existing farms it was shown that with no charges for irrigation and no interest or overhead charges the profit margin per acre of mature tea could be in the region of £75 10s. Such a profit margin can bear quite heavy water and interest charges and leave a net profit which is still attractive.

The branch continued, too, to publish its Monthly Economics and Markets Report, although after June it was converted into a quarterly report. This decision was taken after sounding out opinion of officers within the Department of Conservation and Extension. The report is largely a reference work and its value is not diminished by being published quarterly rather than monthly. In fact, the intention is to enhance its value by including items of interest taken from the world press and other sources of market information. Moreover, single-sheet information reports will be published in addition to and in between the issues of quarterly reports when matters of moment arise. By being brief and to the point, and not buried within the body of the larger report, these information sheets should have a greater impact and keep subscribers more readily informed of happenings within the marketing world.

Reverting to the point made earlier that much has been done in the past year within agriculture to diversify and intensify production, Government, too, has contributed its share and officers of the Economics and Markets Branch have participated fully in investigations made to implement such a policy. They include various proposals for irrigation schemes both within and outside the Sabi Limpopo Authority area, and many settlement schemes throughout the country. Crops which have featured prominently in these proposals include coffee, wheat and cotton. The position of the settlers on the Hippo Valley sugar scheme was also

investigated and one of the branch's officers took part in all the discussions which later ensued on the future of these settlers.

In the sphere of tobacco, the branch continued its cost of production survey at the request of the Rhodesia Tobacco Association and on finance provided by that organization. Also, when the R.T.A. decided to sound out the opinion of the country's tobacco growers on the vexed question of whether production should be controlled or not, the Chief Agricultural Economist was one of the two officers of the Ministry invited to serve in their personal capacities on a Committee charged with assessing the pros and cons of control. The findings of the Committee were later put before all farmers at the time they were asked to vote on the question.

One service which was reluctantly abandoned during the year was the twice-weekly broadcasting of fruit and vegetable prices. This service was discontinued only after much deliberation and after consultation with and subsequent agreement of the Rhodesia National Farmers Union. With the time available on the R.B.C. for fruit and vegetable market broadcasts it was found to be impossible to give enough information to be of value to farmers. The question of reintroducing these broadcasts was raised, however, towards the end of the year. If more time becomes available on the R.B.C. it should not be difficult to broadcast information which could be useful to farmers, although the question of providing adequate staff to prepare the reports will need consideration. This whole question was still under discussion at the end of September.

The Branch continued its surveys in the African areas and expanded them towards the end of the year. With the appointment of an African economist to the staff, referred to in last year's annual report, the possibility of instituting a farm recording scheme for African farmers became a reaility. This officer has devoted his attention during the year entirely to the Purchase Areas. He enlisted the co-operation of 31 farmers in Purchase Areas situated throughout the provinces of Mashonaland North, Manicaland and Victoria. After receiving their assent to co-operate he advised them on the keeping of records and supervised their activities in this sphere throughout the year. Visits at monthly intervals were necessary at first but as the farmers became accustomed to recording it was found possible to extend the visits to two-monthly intervals. The enthusiasm of and the interest shown by the farmers has been most encouraging, and a measure of their keenness can be gauged from the fact that only one farmer, out of the total of 31, failed to maintain adequate records.

The year-end for these accounts was the 30th September, 1965. When the results are analysed they will provide a most useful and up-to-date addition to the knowledge already acquired of Purchase Area farming. It is also anticipated that they will form the basis of farm management information for these areas. The investigation will not be discontinued after 30th September but will be maintained on a continuing basis. The supervision, however, will be passed over to other officers in the Branch, thus releasing the officer who instituted this survey for work in the Tribal Trust Areas.

Marketing has been recognized for some time as one of the major problems in the African areas. Accordingly, as soon as an officer could be released from other duties he was delegated to start work in this field. It was anticipated that his first major investigation would be into the deficiencies, if any, of the cattle marketing system. This investigation is proceeding, but shorter surveys covering the problems of pig, goat and donkey marketing were completed before the end of the year.

One other commodity investigated, which is mainly provided by African production, was seed beans. The room for expansion of this crop, both in European and African areas, was shown to be large, with possibilities of the market absorbing the produce of 4,000 acres in the short term and 10,000 acres in the longer term. Here is a crop which could do much to provide the African farmer with cash which he so badly needs to plough back into further development. In profitability it also compares favourably with other winter crops which can be grown under irrigation.

Another investigation of note completed during the year emanated from the University College of Rhodesia and Nyasaland. It was commissioned and financed, however, by this Ministry. It was the type of survey which necessitated having officers stationed permanently in an area for most of the year. The University College had previously done some work of this nature and had experienced officers available. It lacked finance, however, to complete its studies. Since the lack of data was badly felt by this Branch, the Ministry agreed to provide money for a year's survey. The two reports were duly completed during the year under the titles of "The Labour Economy of Chitowa Native Purchase Area" and "An Economic Survey of Chitowa Native Purchase Area". It gives information on the labour requirements of the main crops grown in the Tribal Trust Areas, together with seasonal and other requirements. Information of this nature was non-existent before the publication of this study and it should, therefore, prove a very useful reference work and form the basis for more extended investigations of a similar nature.

The year 1965 was notable for the African areas in that the African Development Fund levy was abolished in the Purchase Areas and the system of equalizing all marketing charges for crops sold was abandoned in all African areas, i.e. Purchase Area and Tribal Trust lands alike. The disappearance of the A.D.F. levy placed Purchase Area farmers on exactly the same footing as European farmers in regards to the price

received for their products and the fact that they become responsible for financing development within their own areas. The abolition of the Transport Equalization Fund meant that producers became subject to the marketing charges appropriate to their own areas, and not to a uniform charge throughout the country. This innovation should do much to encourage marketing of produce from areas best suited to production because of their proximity to marketing centres. At the time of writing this report it was too early to assess the affects of these changes but developments will be watched with interest.

In reviewing the staff position during the year it is significant to note that the Economics and Markets Branch was fortunate in having no difficulty in keeping its establishment up to full strength. In fact, inquiries for employment in the Branch have come from many graduates who could not be accommodated. There is, consequently, a waiting list of people who wish to be considered for appointment to vacancies which may occur.

Two senior officers resigned during the year—the Chief Agricultural Economist, Mr. L. Uribe, who left at the end of January to take up an appointment with the Food and Agriculture Organization in Rome, and one of the Senior Agricultural Economists, Mr. W. D. Mills, who was appointed to a position in the Sabi-Limpopo Authority at the beginning of September. The consequential vacancies were filled by promotion of officers within the Branch. There were four promotions in all. As a result of these, a Grade 5 post fell vacant but this was filled immediately by the transfer of an officer who had recently acquired an Economics degree at Natal University, on a Government grant, and was being held on the establishment of the Department of Conservation and Extension.

Three of the Branch's officers continued to be employed by the Department of Conservation and Extension, on a secondment basis, for farm management advisory purposes. Their status was changed, however, as from the beginning of July. Up to that time, part of their duties consisted of collecting data from farmers, together with other officers in the Economics and Markets Branch. But with the increased emphasis being placed by the Ministry on the farm management aspect of advisory work, it was decided to put them on a full-time advisory basis as from 1st July. The data collection side of their duties had, therefore, to be taken over by other economists. This raised the serious doubt as to whether the remaining staff was adequate to collect sufficient data to keep the seconded officers supplied with sufficiently up-to-date and adequate material for their purposes. This doubt still remains to be resolved.

Several members of the Branch attended courses overseas during the year. Mr. G. B. Thorpe, Senior Agricultural Economist, attended a twelve-week's course on marketing at the School of Agriculture, University of Nottingham, United Kingdom. Mr. W. V. Lacey studied development economics for six months at the Food Research Institute, Stanford University, California, U.S.A. And, advantage was taken of Mr. M. Mullins being on vacation leave in the United Kingdom for him to spend two months in various parts of England, working in the field with Provincial Farm Management Liaison Officers of the National Agricultural Advisory Service. This was the first time this type of instruction had been undertaken by an officer of the Ministry. Previously, officers had attended formal courses on farm management, but it was felt that the time had arrived for experience to be gained in the day-to-day practical work of farm management advisory officers in other countries. Mr. Mullins was still overseas at the end of September, but his assessment of the usefulness of this type of instruction will be awaited with interest on his return to this country.

One of the Senior Agricultural Economists accompanied the Deputy Secretary, Economics and Markets, on a week's most instructive visit to Pretoria, studying the functioning and organization of South Africa's principal Marketing Boards, the Agricultural Marketing Council and the Economics and Markets Branch of the Ministry. The Chief Agricultural Economist also accepted an invitation to attend as a member of the Rhodesian delegation, the Second International Tobacco Trade Congress in Istanbul and to deliver two papers there.

Members of the branch continued, as in the past, to give courses of lectures at Gwebi and Chibero Agricultural Colleges, and to lecture at various courses organized by the Department of Conservation and Extension. They also continued to serve on many committees. One of the Senior Agricultural Economists assisted at both the Portuguese and South African trade talks held during 1964–65.

The surveys prepared during the year were as follows:

An Analysis of Estimated Capital Requirements for Settler Tenant Coffee Units in the Chipinga–Melsetter Area—1964.

The Impact of Water Charges on the Economics of Coffee Production.

The Production of Pyrethrum in Rhodesia (revised July, 1965).

The Seed Bean Crop in Southern Rhodesia.

The Cost of Production of Flue-cured Virginia Tobacco on some farms in the South-western area of Rhodesia and Zambia for the 1963–64 Crop (for the Rhodesia Tobacco Association).

Supplementary Analysis of some of the Production Methods used by Growers co-operating in the 1963–64 Cost of Production Survey by Different Levels of Profitability.

Maize Production Costs on some European farms in Rhodesia for the 1963–64 Crop—Interim Report.
A Comparison within Districts of some of the Production Methods used by the Most and the Least Profitable Maize Grain Producers co-operating in the 1963–64 Maize Grain Cost of Production Survey.
Sesame (The Market Opportunities in Rhodesia).
Safflower (The Market Opportunities in Rhodesia).
Considerations in Establishing a Tea Factory and a Study of the Capital Outlay and Returns in Establishing Tea Plantings.
The Impact of Water Charges on the Economics of Tea Production.
An Investigation into the Economics of the Hippo Valley Settler Scheme.
A Review on the Market Possibilities of Spice Production in Rhodesia.
The Place of the African-owned Pig in the Future Industry.
Cotton or Maize—Note on Comparative Economics.
The Cost of Establishing a Phormium Tenax Unit.
A Review of the Tobacco Industry in Rhodesia.
The Impact of Tobacco on the Economy of Rhodesia.
Cotton Production Opportunities in the Lowveld.
Wheat—Self-sufficiency?
Farm Management Survey, 1963–64.
Marketing of Citrus Fruit in the Cashel–Umtali Area.

Finally, the branch gratefully acknowledges the co-operation received from farmers in its survey work, and for the help provided by other branches and departments of the Ministry.

A. F. HUNT,
Chief Agricultural Economist.

Co-operatives and Loans Branch Report
for the year 1965.

INTRODUCTION

The Branch has now completed its first calendar year in the Ministry of Agriculture, and the expansion anticipated at the conclusion of 1964 has, in fact, materialized.

The "home" of a department which administers co-operatives has always been one of conjecture, since very few countries can agree under which Ministry it should function—some advocate the Ministry of Agriculture, others the Treasury, others again Commerce and Industry, some even a Ministry on its own. As far as Rhodesia is concerned it was considered that as the co-operative movement was developing in the rural areas in the main, and as agriculture was the basic economy in these areas, the Ministry of Agriculture was the obvious choice. Whilst this may well be true, the real governing feature in the local instance is, it is submitted, the fact that the Co-operatives and Loans Branch has worked very closely with all departments in Agriculture and with both the rural and urban officers of the Ministry of Internal Affairs, and these officers in their wisdom have agreed to the policies of the Branch and assisted in the execution of these policies wherever and whenever asked to do so.

This Branch acknowledges this co-operation and assistance, and is deeply grateful for it.

PROGRESS

General Information

African Societies

Once again the season was a very poor one, with the exception of some parts of Northern Mashonaland. Many farmers did not market a single sack of produce, but they supported their societies whenever and however they could.

Societies in their turn adjusted themselves to the current situation. Where their members were hungry and it became obvious that they would reap little or no crops, societies purchased and organized the delivery of truck loads and lorry loads of maize to their buying depots for sale to members. In areas where members had no cash to buy the maize they pledged some of their cattle, which societies arranged to sell at the Cold Storage Commission as soon as the drought stricken areas' cattle bookings for slaughter were finished. By this means in 1965 £39,583 worth of maize was bought by societies as food, and there is not one penny outstanding to the Grain Marketing Board for these purchases.

Again this year African marketing and agricultural supply societies showed a steady increase in membership except in the Salisbury N.E. region where, due to good crops, membership rocketed up from last year's figure of 2,045 to this year's end of year total of 3,742.

One new Regional Co-operative Office was commenced in Bulawayo during the year, and five more European Co-operative Officers are in training to enable one new office at each of the following centres to be opened: Fort Victoria, Gwelo, Umtali, Salisbury and Bulawayo. All of these are expected to commence operations in February, 1966.

Fifty-nine more primary African marketing and agricultural supply societies were registered during the year.

Missionaries of the Roman Catholic faith have been interesting themselves in African thrift and loan societies, and two such societies have been registered during the year. The total increase in membership of African producer societies this year has been 5,805.

European Societies

There has been an increase in membership in these societies and four more societies have been registered, one of which is a honey co-operative, and another a potato co-operative. The Headlands Co-operative has gone from strength to strength, but progress in some of the others has been much slower.

The total increase in membership of European societies this year has been 143.

Categories of Registered Societies

The following is a list of the types of societies registered under *Cap.* 225 in existence as at 31st December, 1965:

African marketing and agricultural supply societies	169
Indian thrift and loan societies	2
African marketeers society	1
African housing society	1
African wholesale society	1
European marketing and agricultural supply societies	7
European potato marketing society	1
European honey society	1
African credit unions	2
	185

No soceities were dissolved during the year.

Marketing

Of the 169 African marketing societies only 77 marketed any crops. Of the 92 which did not market crops 25 were registered too late in the year to do so. The remainder just had no crops to sell.

The 77 African societies marketed as follows:

Produce		*Sacks*
Maize—A		100,197
B		5,516
C		918
X		242
Groundnuts—A		1,257
B		2,984
Sorghums—S		133
A		201
B		172
Munga—AB		18
Sunnhemp		145
Rapoko		22
Sunflower		266
Velvet beans		57
Potatoes		116
Nyemba		3
Soya beans		2
Wheat		150
		112,399
Sugar beans (1,841 lb. at 200 lb. per bag)	9	
Process peas (19,128 lb. at 200 lb. per bag)	96	
Seed peas (44,255 lb. at 112 lb. per bag)	395	
Ration beans (16,877 lb. at 200 lb. per bag)	85	
Green peas (37,890 lb. at 200 lb. per bag)	140	
Seed beans (804,465 lb. at 112 lb. per bag)	7,183	
924,456 lb.		7,908
		120,307

Also 2,580,335 lb. of cotton (7,881 wool packs) 11,697 lb. of lettuce seed, 1,677 lb. of tomato seed and 52,761 lb. of Burley tobacco.

In addition, 30 societies marketed livestock as follows:

Cattle—A	8	Sheep	62
GAQ	182½	Pigs	187
FAQ	362	Goats	22
Compound	371		271 head
Inferior	180½		
Condemned	7		
Rejects	12		
Mixed	465		
	1,588 head		

The above represented the produce of 10,803 members and gave a crop and livestock turnover of £334,444—an increase of £155,396 over the 1964 figure. This is mainly accounted for by the marketing of 1,401,942 lb. more cotton, and a good maize crop in the Salisbury N.E. region which marketed this year 74,229 sacks as against last year's total of 9,232 sacks.

African societies issued 171,352 sacks to their members at a total value of £25,703 and hired transport for marketing members' produce and for the cartage of supplies to societies costing £35,182.

Produce marketed by African societies in 1965 was graded as follows:

Grade S— 133 sacks
A—101,655 sacks
B— 8,672 sacks
C— 918 sacks
X— 242 sacks

The following figures show the quality of produce in percentages of grades marketed by African societies since 1959:

Grade	1959 %	1960 %	1961 %	1962 %	1963 %	1964 %	1965 %
S	—	—	—	0·20	2·15	1·38	·12
A	67·00	91·52	72·99	67·00	71·50	87·17	91·07
B	32·60	8·01	21·11	26·76	24·92	9·90	7·77
C	·40	·47	5·89	6·04	1·43	1·55	·82
D	—	—	·01	—	—	—	—
X	—	—	—	—	—	—	·22

Again this reveals a very high standard of marketing over the last seven years, and the action of the Grain Marketing Board in holding grading courses for co-operative personnel, and assistance and co-operation given in other ways, to improve marketing is greatly appreciated.

Supplies

There has been plenty of activity upon the supply side of African co-operatives.

Through short-term loans from various sources the following has been purchased this year by African societies for their members:

	£	
Fertilizer	111,672	(In 1964, £48,168)
Seed	21,100	(In 1964, £10,790)
TOTAL	£132,772	(In 1964, £58,958)

This shows an increase spent on seed and fertilizer of £73,814.

Through medium-term loans the following has been purchased by societies for their members:

Agricultural equipment, £52,675. (In 1964, £41,569.)

This shows an increase of £11,106 spent on this commodity.

African societies also purchased through their own cash for members such items as twine, spare parts for implements, etc., which realized £45,132. These services are valuable in that they tend to keep the farmer on his land, and save him the expense of journeys to, and sojourns in, towns.

European societies do not render a detailed return of their purchases for and by members, but a glance at their turnover figures will give an indication as to their progress in this field.

DETAILS OF CO-OPERATIVE SOCIETIES REGISTERED UNDER *CAP.* 225

1. There are 169 African marketing and agricultural supply societies functioning under *Cap.* 225 for the year 1965. The areas in which they operate are:

44 in Purchase Areas
112 in Tribal Trust Lands
12 in Irrigation Settlements
1 in Unreserved Land

169

Statistical details of the year's activities of these societies are as follows:

SUMMARY OF STATISTICAL DETAILS OF AFRICAN MARKETING AND AGRICULTURAL SUPPLY SOCIETIES

Region	Number of societies	Membership	Share capital	Produce and livestock marketed						Cash handlings
				In bags	Cotton (lb.)	Seed and bean crops (lb.)	Livestock head	Other crops		
								Crop	(lb.)	
			£							£
Bulawayo North	15	657	887	130	—	—	815	—	—	29,886
Bulawayo South	17	1,186	1,327	—	—	—	713	—	—	42,970
Enkeldoorn	17	976	1,297	341	20,090	5,570	24	Burley Tobacco	9,578	23,929
Fort Victoria	27	2,760	3,780	405	44,608	—	238	—	—	42,322
Gwelo	25	1,338	1,868	1,410	209,146	—	69	—	—	38,819
Rusape	15	1,218	2,013	7,961	767,895	326,660	—	—	—	65,846
Salisbury N.E.	18	3,529	4,006	76,830	72,634	—	—	Burley Tobacco	43,183	216,457
Salisbury S.W.	19	1,701	2,712	24,758	28,662	—	—	—	—	91,771
Umtali	16	1,377	2,468	564	1,437,300	592,226	—	Seed Tomato	1,677	77,466
								Seed Lettuce	11,697	
	169	14,742	£20,358	112,399	2,580,335	924,456	1,859	Burley Tobacco Seed Lettuce Seed Tomato	52,761 11,697 1,677	£629,466

The above figures in comparison with those for 1964 show an increase of 5,805 farmer members, £6,809 in share capital, and an increase of £312,983 in cash handled.

The sacks marketed show an increase of 55,451.

Statistical details of European marketing and agricultural supply societies for the year 1965 are as follows:

Registered number	*Name*	*Membership*	*Share capital* £	*Cash handling* £
85	The Gwelo Producers' Co-operative Society Ltd.	36	180	19,295
89	Headlands Producers' Co-operative Society Ltd.	125	1,860	130,000
100	Glendale Producers' Co-operative Society Ltd.	30	60	13,732
108	Shamva Producers' Co-operative Society Ltd.	31	31	7,000
109	Melsetter Producers' Co-operative Society Ltd.	15	30	110
127	Bindura Producers' Co-operative Society Ltd.	12	24	7,072
134	Rhodesian Honey Producers' Co-operative Society Ltd.	53	175	674
169	Quality Potato Producers' Co-operative Society Ltd.	11	220	820
184	Sikumi Producers' Co-operative Society Ltd.	19	19	19
		332	£2,599	£178,722

The above figures in comparison with those of 1964 show an increase of 143 farmer members, £2,134 in share capital, and an increase of £58,346 in cash handled.

This means that in 1965 all marketing and agricultural supply societies had a total cash handling of £808,188.

3. Statistical details of societies registered under *Cap.* 225 for purposes other than agriculture:

Registered number	*Name*	*Membership*	*Share capital* £	*Cash handling* £	*Type of society*
13	The Indian Thrift and Loan Co-operative Society Ltd.	53	14,356	29,643	Thrift and loan
21	Nyanyadzi Produce Market Co-operative Society Ltd.	36	288	48	Property owning
57	Mhlahlandlela Housing Co-operative Society Ltd.	38	1,543	4,254	Property owning
58	Zimbabwe Economy Wholesale Co-operative Society Ltd.	19	506	nil	Wholesale consumers
59	The Bulawayo Hindu Co-operative Society Ltd.	52	18,363	7,288	Thrift and loan
135	The Chishawasha Co-operative Credit Union Ltd.	142	35	1,560	Credit
185	Silveira Co-operative Credit Union Ltd.	No particulars available registered November, 1965			Credit
		340	£35,091	£42,793	

The above figures in comparison with those of 1964 show an increase of 127 in membership, and £29,061 in cash handled, and a decrease of £1,945 in share capital.

DETAILS OF CO-OPERATIVE COMPANIES REGISTERED UNDER *CAP.* 181

These relate to Agricultural co-operative companies as registrations under this Act are restricted to that category only.

Registered number	*Name*	*Membership*	*Share capital* £	*Turnover* £
1	Farmers Co-operative Ltd.	3,554	Ord. 118,782 Pref. 709,605	8,600,029
2	Matabeleland Farmers' Co-operative Ltd.	1,317	177,769	1,514,575
8	Rhodesian Co-operative Citrus Growers Association Ltd.	50	266	571
11	The Turkish Tobacco Co-operative Co. of Rhodesia Ltd.	1,064	20,820	53,276
22	The Federated Central Co-operative Co. of S. Rhodesia Ltd.	16	242	576
23	The Victoria Farmers' Co-operative Ltd.	343	47,960	1,038,833
24	Rhodesia National Pig Breeders' Co-operative Co. Ltd.	876	198,268	107,604
26	Gazaland Co-operative Cheese Factories Ltd.	76	61,155	6,163
30	The Umtali Farmers Co-operative Ltd.	388	23,436	375,105
31	The Sinoia Tobacco Farmers' Co-operative Co. Ltd.	58	14,024	32,078
34	Marandellas Farmers' Co-operative Ltd.	429	25,065	767,545
35	Pig Breeders Co-operative Industries Ltd.	8	500	25
36	Colcom Central Co-operative Ltd.	3	322,811	2,091,881
38	Beatrice Agricultural Co-operative Co. Ltd.	144	735	63,719
40	Bromley Agricultural Co-operative Co. Ltd.	36	180	12,226

Registered number	*Name*	*Membership*	*Share capital* £	*Turnover* £
42	Centenary Agricultural Co-operative Co. Ltd.	85	425	50,579
43	Chakari Farmers Agricultural Co-operative Co. Ltd.	22	110	13,000
44	Tengwe Agricultural Co-operative Co. Ltd.	44	220	4,472
45	Rhodesian Poultry Co-operative Co. Ltd.	8	800	102,024
46	Rhodesian Coffee Growers Co-operative Co. Ltd.	22	110	541
47	The Sinoia Agricultural Co-operative Co. Ltd.	23	115	1,672
48	Mashonaland Cattle Co-operative Co. Ltd.		(registered 1965)	
		8,566	£1,723,398	£14,836,494

The above figures show a decrease in membership of 157, but an increase in share capital of £193,392 and in turnover £1,396,811 in relation to the 1964 figures.

One co-operative company was dissolved during the year.

LOANS

The Agricultural Loan Fund had a difficult year in 1965. The expected district accounting service was not implemented by Government for reasons of economy, and loan repayments had to be organized through post offices and through district commissioners' offices, where no post office facilities were available.

Whilst this system enabled remittances to be made by those borrowers who wished to repay their loans, it made no provision for a "dunning" programme in cases of reluctant debtors. Furthermore, the season was not helpful. Nevertheless, in spite of these difficulties, African farmers made reasonable efforts to repay their loans and in some cases even "Herculean" efforts.

Loans were again issued for this season, chiefly through co-operative societies, which, as they expand, are taking over more and more loans from the district loans committees, which are planned to fade out entirely as soon as co-operatives can give the required cover.

Successful loan applicants from district loans committees this season had to sign farmers' stop orders where these could be registered on existing marketing organizations—a few exceptions were made in certain areas where no accredited marketing organizations were available. In these cases borrowers were warned of the possibility of legal action upon failure to repay without adequate reason.

African societies gratefully acknowledge the fact that Barclays Development Corporation, through their local representative, have been responsible for making the greatest proportion of the loans available to their members, and they welcome the local representative of the Corporation at their societies whenever he can find the time to go.

STAFF AND ESTABLISHMENT

Co-operatives Section

The appointment of lady clerk/typists to all regions has provided the required relief to Co-operative Officers by taking much of the pure office routine off their hands, thus enabling them to do more extension and administrative work in the field, and to take on more co-operatives.

The Co-operative Officer, Head Office, has had to take on one lady clerk to assist him in the gigantic task of "watching over" approximately 170 sets of books, and in the ensuing year it will be necessary to transfer to him two senior Assistant Co-operative Officers (African) to enable him to cope with this most essential educational and inspection work. These two officers will be trained in the bookkeeping requirements of secondary societies (co-operative unions), the formation of which is now being undertaken.

Marketing Section

As expected and planned the Marketing Liaison Officer's activities are becoming more and more an integral part of the African co-operative movement, and he has been of great assistance to Regional Co-operative Officers in the field this year. He has also represented the Branch on committees of Statutory Boards, and has liaised with the Ministry of Agriculture and all its departments, as well as with other Ministries, in matters relating to agricultural marketing, and particularly so where the African farmers' economic interests are at stake.

Loans Section

An increase in the number of loans "put out" has put a great strain on the staff concerned, and it is quite obvious that the use of officials administering the Agricultural Loan Fund on a "part time" basis should no longer continue. This matter is now under consideration, and it is to be hoped that a decision can be reached soon.

All staff have performed their duties most efficiently and most loyally. It was once said that to be a successful Co-operative Officer a man must be dedicated to his job—it is most certainly true in this Branch, and these officers deserve the highest praise for the long hours and hard work they have put into this year's co-operative activities.

PRIMARY MARKETING BY AFRICANS

As the traditional African crops are marketed through well-established channels, this officer spent most of his time representing African interests on the bodies which control these channels. The goal is to increase production and improve standards, yet at the same time to ensure a fair return to the grower.

Discussions have been held on three main subjects—cotton, sorghums and groundnuts. With sorghums the aim is to find varieties which yield well in this country and at the same time are suitable for malting and stockfeeds. This will involve a considerable amount of research but nevertheless it is heartening to realize that the research will not be in vain as far as African producers are concerned. Through education many Africans, particularly in the Purchase Areas, now realize that to get real benefit from a cash economy, they must market crops which are varietally pure and at the same time of a type required by the processors.

In the case of groundnuts there are two things to be achieved. First, the scourge of aflatoxin infestation must be eliminated from marketed nuts, and second the aim to produce the Rhodesian Pink nut from the many varieties of nuts grown in the country. Strict control and education have done much to induce the African to remove mouldy nuts (a bad source of aflatoxin infestation) from his deliveries and results have been encouraging although the problem of aflatoxin has by no means been solved yet. Because of the drought there were not even enough groundnuts produced to meet the needs of the local industrialists. Consequently no exporting of nuts was possible and the acceptability of the Rhodesian Pink nut on the overseas market could not be tested. One difficulty has arisen. As explained, the Rhodesian Pink nut is a combination of many types and varieties of groundnuts. If it is used for seed purposes it must be appreciated that the growing characteristics of the types and varieties differ considerably so that uniform stands in the field are hard to achieve. This problem must be solved if the Rhodesian Pink nut is to be a success.

The Marketing Liaison Officer attended many meetings during the year on the subject of the proposed Cotton Growers Co-operative. All parties have now given their views and, in fact, a referendum of all growers was held during the year. The vast majority of those growers who voted favoured the establishment of the proposed co-operative. Government's decision is awaited.

From the weather point of view 1965 was not kind to farmers. As a result more thought could be given to improvement of techniques. A scheme has been worked out whereby the co-operative movement, in conjunction with Conex, can help to raise the volume and standard of African production. The details of the scheme have not been precisely defined because it involves guide lines only. The basis of the proposals is that it is no good having a production drive if there is no satisfactory marketing system. Conversely it is no good having a satisfactory marketing system if there are no good crops to put through this system. Therefore, the improvements offered to the individual grower by co-operative marketing are closely related to production techniques and results. Close co-operation in agricultural extension and marketing must therefore improve the African farmer's lot.

The year has shown quite clearly that the policy of encouraging co-operative marketing in the African areas is the correct one. Consequently, the Marketing Liaison Officer has moved more and more into the co-operative field. In fact it is clear that in 1966 he will to all intents and purposes be an integral part of the Co-operative Branch staff.

GENERAL

An intensive education programme for co-operative society personnel was undertaken during the year. The African farmers showed tremendous interest in this field, and greatly benefitted not only from courses conducted at regional level, but also from visits to such bodies as the Cold Storage Commission, the Grain Marketing Board, the Cotton Ginnery and the Tobacco Floors. These bodies are to be sincerely thanked for their courteous reception of the trainees, and can rest assured that their efforts were highly appreciated by the African farmers.

Cattle marketing, through African co-operatives to the Cold Storage Commission, has increased considerably, and members are now obtaining loans through their societies for cattle feeding, and are endeavouring to obtain higher grades by this means.

This year 7,881 wool packs containing 2,580,335 lb. of cotton were marketed by African societies as against 3,112 wool packs containing 1,178,393 lb. of cotton last year. This indicates a *very great increase in cotton production and it is pleasing to note of a high quality.*

A loan of £1,600 was made available to the Chitomborgwizi Producers' Co-operative Society Ltd. with which the society purchased a tractor, trailer, plough and disc harrow for hiring out to its members. In

order to achieve greater credit-worthiness for this loan all of the society's members voluntarily doubled their share capital. It is too early to say how successful the scheme will be.

In Chitowa Co-operative Society (Mrewa) the committee devised a scheme to improve the credit-worthiness of the society. It is based on concentrating efforts on small acreages supported by early tractor ploughing, the planting of hybrid seed, the use of recommended fertilizers and overall co-operation with the staff of the Department of Conservation and Extension. It is hoped to produce high yields from these small acreages, the total proceeds of which are to be used exclusively to reduce existing loans. The initial phase of this scheme is encouraging.

Finally it is desired to place on record the grateful appreciation of this Branch for all the assistance given to the staff by provincial commissioners, district commissioners, district officers, provincial conservation and extension officers, group officers, agricultural extension officers and their African staff, banks, the Barclays Development Corporation, Grain Marketing Board officials, transport contractors, Railway officials, all those persons who supply equipment, seed, fertilizer, sacks and service to societies and to all those administrative and accounts officers in the Ministry of Agriculture who went out of their way to facilitate the smooth running of the Branch in 1965.

R. J. DINNIS,
Under Secretary, Co-operatives and Loans.

APPENDIX "A"

ANNUAL STATISTICS: AFRICAN CO-OPERATIVE SOCIETIES REGISTERED UNDER *CAP.* 225 FOR MARKETING AND AGRICULTURAL SUPPLIES

	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
Registered societies in operation	2	6	12	14	21	38	52	67	110	169
Buying depots	4	11	22	26	27	78	130	167	226	301
Membership	187	398	765	1,206	1,830	3,460	4,897	6,280	8,937	14,742
Share capital	£374	£806	£1,540	£2,440	£3,646	£6,356	£8,409	£10,186	£13,549	£20,358
Crops marketed (standard bags)	—	16,354	18,569	30,607	26,813	105,309	111,590	64,992	64,856	120,307
Cotton marketed (woolpacks)	—	—	—	21	15	527	952	1,771	3,112	7,881
Cash handled	£421	£31,478	£35,077	£55,580	£71,987	£220,529	£253,140	£202,058	£316,483	£629,466
Reserve fund	—	£106	£147	£401	£569	£2,026	£3,757	£4,814	£5,551	£7,910
Sacks issued	—	17,848	20,897	31,532	27,532	106,377	120,933	77,101	66,500	171,352
Value of fertilizer purchased	—	—	£2,160	£7,314	£7,849	£13,607	£7,593	£7,463	£48,168	£111,672
Value of seed purchased	—	—	£292	£2,486	£4,672	£5,673	£4,493	£4,735	£10,790	£21,100
Value of agricultural equipment purchased	—	—	£88	£512	£4,586	£18,335	£23,346	£18,822	£41,569	£52,675
Livestock marketed (head)	—	—	—	—	—	—	—	—	112	1,859

APPENDIX "B"

ANNUAL STATISTICS: CO-OPERATIVE SOCIETIES REGISTERED UNDER *CAP.* 225 FOR OTHER THAN MARKETING

	1959	1960	1961	1962	1963	1964	1965
Registered societies in operation	2	3	2	3	5	5	7
Membership	342	523	91	111	309	213	340
Share capital	£9,171	£10,845	£9,550	£11,632	£38,864	£37,036	£35,091
Cash handled	£9,171	£40,042	£17,466	£29,599	£34,042	£13,732	£42,793
Reserve fund	—	£4	£8	£12	£63	£101	£1,098

AGRICULTURAL LOAN FUND

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 30TH JUNE, 1965

	£	£		£	£
Interest payable on Loan Borrowings		5,521	Interest Receivable on:		23,147
Balance being Excess of Income over Expenditure carried to Accumulated Fund		17,626	Short-term Loans	6,444	
			Medium-term Loans	9,421	
			Long-term Loans	7,168	
			Investments—Treasury Bills	114	
		£23,147			£23,147

BALANCE SHEET AS AT 30TH JUNE, 1965

	£	£		£	£
Loans		331,410	Loans (Capital) Outstanding		384,238
Consolidated Revenue Fund (Loan Account)	185,000		Short-term Loans	146,186	
African Production and Marketing Development Fund	142,410		Medium-term Loans	157,742	
Tribal Trust Land Board	4,000		Long-term Loans	80,310	
Grant		66,666	Debtors for Interest		18,391
International Co-operative. Administration for Credit. Facilities for African Farmers.			Cash at Bank		14,301
Accumulated Fund		18,822			
Balance taken over from African Production and Marketing Development Fund	1,196				
Add: Balance Transferred from Income and Expenditure Account	17,626				
Current Liabilities		32			
Temporary Deposits.					
		£416,930			£416,930

GOVERNMENT STAFF OF THE CO-OPERATIVES AND LOANS BRANCH AS AT 31st DECEMBER, 1965

EUROPEAN

1	Registrar of Co-operative Societies and Companies
1	Deputy Registrar of Co-operative Societies
1	Assistant Registrar of Co-operative Societies
15	Co-operative officers
1	Marketing Liaison Officer
1	Clerk (male)
2	Clerks (female)
1	Shorthand-typist
10	Typist/clerks (female)
33	

AFRICAN

8	Assistant Co-operative officers
44	Co-operative assistants
4	Office orderlies
56	

Department of Research and Specialist Services Report

for the period 1st October, 1964, to 30th September, 1965

GENERAL

The year under review has been reasonably successful, and it has been possible to maintain services and continue research work at a high level. This was attained under difficult conditions with shortages of staff and finance. The Rhodesia Research Advisory Committee visited all the stations during the year in order to continue with the close examination of all research projects.

STAFF

The following major staff changes took place during the year. Mr. R. G. Jones retired as Chief Dairy Officer to take up the position of General Manager of the Dairy Marketing Board. Mr. C. N. Hayter was appointed as Chief Horticulturist. Dr. J. W. Rowland (Henderson), Dr. J. M. Rattray (Matopos) and Dr. W. L. Fielding (Gwebi College) retired during the year and were succeeded by Dr. R. C. Elliott, Mr. D. L. Barnes and Mr. R. D. Mundy respectively. A separate Branch of Botany was created with Dr. H. Wild in charge. Entomology, Plant Pathology and Seed Services were combined into one Branch of Plant Protection and Mr. J. A. Whellan appointed as Chief Plant Protection Officer.

The Public Services Board completed their survey of the professional officers establishment during the year. Certain improvements in gradings and salary scales were consequently introduced. Although certain advances have been made, salary scales in Rhodesia are no longer competitive with other countries and recruiting of staff is becoming increasingly difficult. A certain amount of progress has also been made with negotiations in connexion with conditions of service for technical staff, but at the time of writing no finality had been reached.

	Establishment at 30.9.65	Appointments		Transfers		Retirals	Resignations	Vacancies at 30.9.65
		Promotion	New	From Dept.	To Dept.			
Director	1	—	—	—	—	—	—	—
Assistant Directors	2	—	—	—	—	—	—	—
Chiefs of Branches	7	2	—	—	—	1	—	—
Officers in charge of research and experiment stations and principals of colleges	11	3	—	—	—	3	—	—
Senior professional research officers and senior lecturers	31	—	—	—	—	—	—	1
Professional research officers and lecturers	83	—	13	—	—	—	10	17
Contract professional officers	11	—	7	—	—	—	—	—
TOTAL PROFESSIONAL STAFF	146	5	20	—	—	4	10	18
Technical research officers and instructors	76	—	22	5	—	—	19	6
Meat graders, cattle graders, milk recorders and plant, fruit and grain inspectors	40	—	1	—	—	—	3	2
TOTAL TECHNICAL STAFF	116	—	23	5	—	—	22	8
Agricultural and laboratory assistants	54	—	—	—	—	—	—	—
Administrative assistants	3	1	—	—	—	—	—	—
Handymen, groundsman, orderlies and other posts	73	—	4	—	—	—	4	—
Clerical posts	30	—	5	—	—	—	6	1
TOTAL POSTS	432	6	52	5	—	4	42	27

COMMITTEES AND COUNCILS

Among the committees or councils on which members of the department served were:

Aflatoxin Standards Committee (D. H. Saunder, Chairman; R. G. Thomas and D. G. Bushnell).
Association pour l'Etude Taxonomique da la Flore d'Afrique Tropicale (Editor for South Central Africa, H. Wild).
Standing Committee on African Beef Production (T. H. Vorster).
Coffee Production Committee (P. A. Donovan, Chairman; J. A. Taylor).
Chibero College Council (D. H. Saunder and J. W. Walsh).
Cold Storage Commission of Rhodesia (T. H. Vorster).
Commonwealth Agricultural Bureaux (Liaison Officer, D. H. Saunder).
Commonwealth Bureaux of Pastures and Field Crops (Official Correspondent, O. West).
Cotton Marketing Committee of the Grain Marketing Board (P. A. Donovan and A. H. McKinstry, advisory).
Rhodesia Cotton Growers' Association Council (A. H. McKinstry, advisory).
Cotton Seed Multiplication Sub-committee of the Cotton Growers' Association (F. E. M. Gillham, advisory).
Dairy Marketing Board (G. M. Phillips).
Fibre Production Committee (P. A. Donovan, Chairman; P. V. M. Richards).
Fertilizer Advisory Committee (D. H. Saunder, Chairman; R. G. Thomas and A. G. H. Rattray).
Fertilizer Import Quota Committee (R. G. Thomas and A. G. H. Rattray).
Groundnut Committee of Grain Marketing Board (R. G. Thomas).
Gwebi College Council Advisory Committee (D. H. Saunder and H. R. Mundy).
Hydrology Co-ordinating Committee (D. H. Saunder).
Livestock Improvement Committee (T. H. Vorster).
Council of International Red Locust Control Service (J. A. Whellan, President).
Lowveld Research Liaison Committee (P. A. Donovan, Chairman; K. E. Cackett).
Standing Committee on Mechanization (J. W. Walsh).
Pig Industry Board (T. H. Vorster).
National Pig Breeders' Association Committee (H. R. Mundy and W. M. O'Donovan).
Inter-African Phytosanitary Commission (J. A. Whellan, Chairman).
Rhodes Inyanga Experiment Station Growers' Liaison Committee (P. A. Donovan, Chairman; C. N. Hayter, C. B. Payne, M. A. Cassidy).
R.A.J. Editorial Committee (D. H. Saunder and O. West).
Rhodesian Journal of Agricultural Science, Editorial Board (D. H. Saunder).
Rhodesian Research Advisory Committee (J. C. Raath, P. A. Donovan, D. H. Saunder).
SARCCUS Standing Committee on Bush Control (O. West).
Science Council of Rhodesia (J. C. Raath and D. H. Saunder).
International Seed Testing Association, Germination Committee (Sub-tropical Seeds) (K. B. Hanssen, member).
Show Society Committee (various staff members).
Seed Maize Management Committee (A. G. H. Rattray).
Seed Potato Association Executive Committee (A. G. H. Rattray and T. Carvalho).
Standards Association: Animal Feeding-stuffs and Pharmaceutical Committees (D. G. Bushnell).
Tsetse and Trypanosomiasis Control Committee (O. West).
Tobacco Research Board (D. H. Saunder).
Water Control Research Committee (O. West, J. G. Thompson and H. R. R. Metelerkamp).

VISITS OUTSIDE RHODESIA

Mr. A. P. McNab attended the Pig Progeny Testing Committee in Pretoria, October, 1964.

Mr. J. C. Raath visited New Zealand in November, 1964. Scientific Association Meeting.

Dr. D. H. Saunder and Mr. P. A. Donovan attended Research Institute at Blantyre in February, 1965.

Mr. D. G. Bushnell, of Chemistry, and Mr. G. W. Herd, of Plant Pathology, attended Symposium on Mycotoxin in Johannesburg from 22nd February, 1965, to 26th February, 1965.

Mr. R. G. Thomas, Chief Chemist, visited the United Kingdom and Europe on recruiting tour, March, 1965.

Dr. J. O. Whiteside visited Mount Edgecombe Sugar Research Station, in May, 1965.

Mr. J. R. Tattersfield and Mr. J. O. Meikle, of Salisbury Research Station, visited Lilongwe, Malawi, to see work in progress there on groundnuts by the staff of the A.R.C.

Dr. H. Wild and Mr. R. B. Drummond, of Botany Branch, expedition to Bechuanaland for Flora Zambesiaca from 8th March, 1965, to 28th March, 1965.

Mr. J. A. Whellan, of Entomology, presided at Red Locust Control Services Conference in Zambia in July, 1965.

Dr. D. H. Saunder and Dr. H. Wild attended C.A.B. Conference in the United Kingdom from 9th July, 1965, to 29th August, 1965.

Mr. J. C. Raath attended Animal Production Conference in Bloemfontein in November, 1965.

Mr. P. A. Donovan went on recruiting tour of South Africa, August, 1965.

Mr. J. C. Raath attended Seed Maize Conference in Johannesburg on the Committee of Inquiry into the Seed Maize Industry of Rhodesia, 16th August, 1965.

CONFERENCES

Among the Conferences held or attended by staff of the Department were the following:

Conference on Agronomists and Plant Breeders (4th), Gatooma (numerous staff members).
Annual Conference of the South African Society of Animal Production in Bloemfontein (R. C. Elliott and T. H. Vorster).
C.A.B. Review Conference, London (D. H. Saunder and H. Wild).
National Conference on Adult Education and External Studies (W. L. Fielding).
Annual Congress of the Rhodesia National Farmers' Union (numerous staff members).

Conference of Horticulturists (1st), Inyanga (several staff members).
Conference of Horticulturists (2nd), Chipinga (several staff members).
Annual Council Meeting (17th) of International Red Locust Control Service (J. A. Whellan).
Natural Resources Board Conference of I.C.A.s (several staff members).
Conference of Pasture Research Officers (6th), Henderson (numerous staff members).
Interstate Phytosanitary Meeting (J. A. Whellan).
Congress of the South African Association for the Advancement of Science (F. E. M. Gillham).
Annual Congress of the Rhodesia Tobacco Association (4th) (W. L. Fielding).
Annual Conference (13th) of Tobacco Research Board (various staff members).
Mr. P. A. Donovan visited the four University Faculties of Agriculture and various Research Institutes in South Africa.
Dr. D. H. Saunder and Mr. P. A. Donovan visited the Tea Research Stations, Malawi.

VISITORS

Among those who visited Branches, Stations and Colleges of the Department during the year were the following from outside Rhodesia:

Mr. Allen, Bank of England, London.
Mr. K. R. M. Anthony, Agronomist, Empire Cotton Growing Corporation, London.
Mr. F. C. Bawden, Director, Rothamsted Experiment Station, United Kingdom.
Mr. N. W. Briton, Principal, Queensland Agricultural College, Queensland, Australia.
Mr. Brown, Commonwealth Scientific and Industrial Research Organization, Division of Animal Nutrition, Australia.
Mr. B. L. Burtt, Senior Principal Scientific Officer, Royal Botanic Gardens, Edinburgh.
Mr. R. L. Coleman, Research Agronomist, Wollingbar Agricultural Research Station, New South Wales, Australia.
Mr. C. du Plessis, Director, International Red Locust Control Services, Abercorn.
Mr. E. M. Gant, Somerset West, South Africa.
Dr. E. Gorzelak, Food and Agricultural Organization.
Dr. D. Hall, Director, Tropical Stored Products Centre, Department of Technical Co-operation, United Kingdom.
Dr. D. J. Hankinson, Professor of Dairy Technology, University of Massachusetts.
Dr. Hopf, Entomologist, Department of Technical Co-operation, London, United Kingdom.
Mr. P. A. Jones, Deputy Director of Agriculture (Research), Swaziland.
Mr. S. C. Kiern, Superintendent of Fairchild Tropical Garden, Florida.
Professor Knapp, University of Guessen, West Germany.
Professor R. B. Lee, Harvard University, U.S.A.
Mr. Lewis, Haven Stud, Herefordshire, England.
Dr. E. D. S. Little, Overseas Liaison Officer of Great Britain Weed Research Organization.
Mr. G. W. Lock, Canterbury, Kent, England.
Professor McClymont, University of New England, Armidale, New South Wales, Australia.
Dr. A. E. G. Markham, Food and Agricultural Organization, Training Advisor, Dar-es-Salaam.
Dr. G. F. Mees, Leiden, Holland.
Dr. M. J. Mulcahy, Officer-in-Charge, C.S.I.R.O. Division of Soils in Western Australia.
Mr. H. G. Porter, Cotton Chief, U.S. Department of Agriculture.
Mr. D. Rhind, Advisor on Agricultural Research, Ministry of Overseas Development, London, England.
Mr. D. F. Ruston, Director, Empire Cotton Growing Corporation, London, England.
Dr. A. J. Rutter, Imperial College, London, England.
Dr. E. Schieber, Chief Plant Pathologist, Guatemala.
Mr. Swynnerton, Colonial Development Corporation.
Dr. P. Symmons, Antilocust Research Centre, London, England.
Dr. M. Thain, Assistant Director, Tropical Products Institute, London, England.
Hon. Mr. D. C. H. Uys, South African Minister of Agricultural Economic Affairs.
Dr. P. K. van der Merwe, National Chemical Products, South Africa.
Professor K. H. Voous, Amsterdam, Holland.
Mr. C. Woan, Chief Cotton Grader, Republic of South Africa.

PUBLICATIONS

Publications by staff of the Department during the year 1964–65 were as follows:

Atkinson, F. J. B. "The possibilities for increasing beef, mutton and sheep production in the Eastern Highlands." Rhod. agric. J. 61, 5, 96–7, 1964.
Barnes, D. L. "Pastures and beef production in the sandveld." Mod. Farm. Cen. Afr. June, 1965.
Barnes, D. L. "Veld management in the high-rainfall sandveld." Mod. Farm. Cen. Afr. July, 1965.
Barnes, D. L. "Building up improved pastures in the sandveld." Mod. Farm. Cen. Afr. August, 1965.
Barnes, D. L. "The effects of frequency of burning and mattocking on control of coppice in the Marandellas sandveld." Rhod. Jl. Agric. Res. 3, 1, 55–6, 1965.
Barnes, D. L. "A trial of three-herds-to-four paddocks system of management at three stocking rates in the Marandellas sandveld." Rhod. Jl. Agric. Res. 3, 2, 1965.
Barnes, D. L. "Notes on Beehive Paspalum, Wintergreen Paspalum and Paraquay Paspalum, three new grasses released by Grasslands Research Station." Cyclostyled.
Barnes, D. L. "Improved pastures in the sandveld." Cyclostyled.
Barnes, D. L. "Irrigated pastures." Cyclostyled.
Barnes, D. L. "A stocking rate trial in the Rhodesian high-altitude sandveld." Rhod. Jl. Agric. Res. (In press.)

Barnes, D. L. "Studies on the use of Sabi Panicum for Foggage." Rhod. Jl. Agric. Res. (In press.)
Bushnell, D. G. "Importance and prevention of mould on groundnuts." Rhod. agric. J. 61, 108–110, 1964.
Bushnell, D. G. "Harmful groundnut mould must be prevented." Rhod. Farmer. 35, Dec. 4, 1964.
Bushnell, D. G. "Incidence of aflatoxin in the Rhodesian groundnut crop." Rhod. agric. J. 62, 94–96, 1965.
Bushnell, D. G. "Analyses of Rhodesian feedstuffs: Part I Concentrates, Part II Silages." Rhod. agric. J. (In press.)
Cackett, K. E. "A simple device for measuring canopy cover." Rhod. Jl. Agric. Res. 2, 1, 56. 1964.
Cackett, K. E. "A review of some agronomy studies on irrigated cotton in the lowveld." Paper presented to the Agronomy Conference, 1965, Gatooma Research Station, March, 1965.
Cackett, K. E. "Thermal systems for predicting flowering dates of maize, sorghum, and wheat in Rhodesia." Rhod. Jl. Agric. Res., 1965.
Cackett, K. E. "Winter production of seed beans in the lowveld." Rhod. Jl. Agric. Res. 62, 3, 69–71, 1965.
Cackett, K. E., and Metelerkamp, H. R. R. "Evapotranspiration of maize in relation to open-pan evaporation and crop development." Rhod. Jl. Agric. Res. 2, 1, 35–44, 1964.
Cackett, K. E., and Patterson, C. R. "The cropping potential of the Chisumbanje Basalt." Rhod. Jl. Agric. Res. 62, 2, 34–9, 1965.
Cleghorn, W. B. "Report on the condition of grazing in Tribal Trust Land." Cyclostyled Report, Department of Research and Specialist Services.
Cleghorn, W. B., and Hill, J. C. R. "Dichapetalum symosum (Hook) Engl. (umKausaan) recorded from the Nuanetsi District." Rhod. agric. J. 62, 5, 99–100, 1965.
Cooper, G. H. "Force moulting of layers." Rhod. Agric. J. Jan.-Feb., 1965.
Cooper, G. H. "First Rhodesian random sample laying test." Rhod. agric. J. May-June, 1965.
Corby, H. D. L. "Some thoughts on the future of pasture research in Rhodesia." Paper presented at the Sixth Conference of Pasture Research Officers, Department of Research and Specialist Services. April, 1965. Cyclostyled.
Corby, H. D. L. "A glossary of ploughing terms for use in ploughing matches with mouldboard ploughs." Cyclostyled.
Drummond, R. B. "New and little known species from the Flora Zambesiaca Area 17: Two new Taxa in Ziziphus." Bol. Soc. Brot. Ser. 2, 39, 57–60, 1965.
Drummond, R. B., and Shone, D. K. "Poisonous plants of Rhodesia." Rhod. agric. J. 62, 1–64, 1965.
Edwards, A. B. "Milking machine testing." Rhod. agric. J. Mar-Apr., 1964.
Edwards, A. B. "Pipe-line parlours increase labour efficiency during milking." Rhod. agric. J. Nov.-Dec., 1964.
Elliott, R. C. "High-concentrate system of fattening cattle." (In many agricultural magazines in Rhodesia and South Africa.)
Elliott, R. C., Topps, J. H., Reed, W. D. C., and Cmelik, S. "Effect of season and of supplementary feeding on the rumen contents of African cattle grazing sub-tropical herbage." Part 1. Jl. agric. Sci. 64, 387.
Elliott, R. C. (Topps, J. H., Elliott, R. C., and Reed, W. D. C.) "Effect of season and of supplementary feeding on the rumen contents of African cattle grazing sub-tropical herbage." Part 2. J. agric. Sci. 64, 397.
Elliott, R. C. (Topps, J. H., and Elliott, R. C.) "Nitrogen metabolism of cattle and sheep indigenous to Southern Africa." Outlook on Agriculture. 4, 6, 310–15, 1965.
Elliott, R. C. (Topps, J. H., and Elliott, R. C.) "Relationships between concentration of ruminal nucleic acids and excretion of purine derivatives by sheep." Nature 205, 498.
Elliott, R. C. (Topps, J. H., and Elliott, R. C.) "Studies of natural herbage of the sub-tropics." Part 3. J. agric. Sci. 63, 245.
Gatooma Staff. Contributions to "Cotton Handbook" published by Rhodesian Cotton Growers' Association, 1965.
Gillham, F. E. M. "Agriculture, education and the population explosion." (Presidential address to Section "C" of the South African Association for the Advancement of Science presented at the East London Congress on 10th July, 1965.) In press, South African Journal of Science.
Graham, R. N. "Sorghum grain and sorghum silage." Conservation Officers' Handbook.
Graham, R. N. "Sorghum potential in the higher rainfall areas." Rhodesian Tobacco Journal. April, 1965.
Graham, R. N. "Can sorghum be more widely grown?" Rhodesian Farmer, 10th Sept., 1965.
Hanham, D. P. "Sheep production can be a profitable enterprise." Mod. Farm. Cen. Afr. March, 1965, 27–31.
Hanham, D. P. "Do's and dont's of sheep management." Rhod. Farmer, 35, 42, 14, 1965.
Hanham, D. P. "Sheep Calendar." Rhod. agric. J. 62, 1, 1 and 3, 1965. Rhod. Farmer, 35, 42, 15, 1965.
Hanssen, K. B. "Flower seed production." Rhod. agric. J. 61, 94–7.
Herd, G. W., and Loveless, A. R. "Studies on Rhodesian Ergots." III Claviceps rhynchelytri sp. nov. and Claviceps digitariae Hansford, Kirkia 5, 21–4.
Kerr, W. E. "Ear and Cob Rot diseases of maize." Rhod. agric. J. 62, 11–23.
Landsberg, J. J. "Moisture requirements of lucerne on shallow granite sand." M.Sc. Thesis, University of Natal.
McNab, A. P. "Pig testing results, 1963–64." Rhod. agric. J. 61, 126–7, 1965.
McNab, A. P. "The odds are against the Merino in Rhodesia." Die Wolboer, March and April, 1965.
Martin, G. C. "The occurrence in Rhodesia of Meloidogyne incognita var. acrita attacking cotton and Heterodera cacti on Mamillaria sp." F.A.O. Plant Prot. Bull. 13, 2.
Metelerkamp, H. R. R. "Irrigation efficiency under surface irrigation on the alluvial soils of the Sabi Valley." Rhod. Jl. Agric. Res. 62, 3, 64–8, 1965.
Metelerkamp, H. R. R., and Cackett, K. E. "Cotton evapotranspiration in relation to pan evaporation and crop growth." Rhod. Jl. Agric. Res. 3, 1, 9–13, 1965.
Mills, P. F. L. "Effects of fertilizer on the botanical composition of veld grassland at Matopos." Rhod. agric. J. Sept.-Oct., 1964.
Mills, P. F. L. "Effects of nitrogen on three types of veld hay at Matopos." (In press.)
Mundy, H. R. "Report on Steer Feeding Trial." Rhodesian Farmer, 1965.
Parkyn, P. E. "Butter quality starts on the farm." Rhod. agric. J. May-June, 1965.
Payne, C. B. "Notes from Rhodes Inyanga Orchards." Hortus, 1, 5–6.
Payne, C. B. "Notes from Rhodes Inyanga Orchards." Hortus, 2, 12–15.
Payne, C. B. "Rhodes Inyanga Orchards Newsletter No. 5." Hortus, 3, 1–6.
Payne, C. B. "Rhodes Inyanga Orchards Newsletter, Field Day Number, 1st July, 1965." Cyclostyled.
Payne, H. A. W. (Voous, K. H., and Payne, H. A. W.) "The grebes of Madagascar." Ardea, 53, 1–31.
Phillips, G. M. "Cheese making in the Chipinga Area." Rhod. agric. J. (In press.)
Reed, W. D. C., Elliott, R. C., and Topps, J. H. "Phosphate excretion of cattle fed on high-energy diets." Nature (London), 208, p. 953, 1965.
Reed, W. D. C., and Elliott, R. C. "Studies of the metabolism of cattle given high-concentrate diets." J. agric. Sci. (In press.)
Richardson, M. E. "Control of Potato Tuber Moth." Rhodesian Farmer 36, 23, 1965.
Richardson, M. E. "Potato Tuber Moth Research." News Bulletin Zoological Society of S. Africa, 6, 2, 1965.

Rodel, M. G. W. "Results of some preliminary investigations into increasing production from planted and fertilized summer pastures at Henderson Research Station." The Windmill, June, 1965.
Rose, D. J. W. "Insect Pests and Climate." P.A.N.S. 11, 169–76, 1965.
Rose, D. J. W., and Hodgson, C. E. "Maize Snout Beetles." Rhod. agric. J., 62, 85–102, 1965.
Rowland, J. W. "Some aspects of land development in Rhodesia." Modern Farming, Nov., 164.
Rowland, J. W. "The importance of pastures in rural development." Paper presented to 6th Annual Conference of Pastures Officers, April, 1965.
Simon, B. K. "Charama Plateau Exped., 1965." Botany Report, 35–40, 1965.
Taylor, J. A. "Kenya's experience may benefit Rhodesian coffee industry." Rhod. agric. J., March-April, 1965.
Thomas, R. G. "Ammonium phosphate fertilizers." Rhod. Farmer. (In press.)
van der Lingen, M. I. "Fish farming. Intensive raising of a meat crop." Modern Farming. January, 1965.
van der Lingen, M. I. "Biology of fish of economic importance." Paper presented at a Symposium on Fisheries. Kariba, June, 1965.
Ward, H. K., and Cleghorn, W. B. "The effects of ring-barking trees in Brachystegia Woodland on the yield of veld grasses." Rhod. agric. J. 61, 5, 1964.
West, O. "Pasture management and improvement in Rhodesia." Rhod. agric. J. 61, 6, 119–25, 1964.
West, O. "Fire in vegetation and its use in pasture management with special reference to tropical and sub-tropical Africa." C.A.B., Commonwealth Bureau of Pastures and Field Crops, Hurley, Berkshire, Mimeographed Publication, 1/1965.
West, O. "A note on the seeding of Pennisetum clandestinum in the Melsetter District of S. Rhodesia." S. Afr. J. Sci. 61, 11.1965.
Whellan, J. A. "The habitat of Welwitschia bainesii (Hook. f.) barr." Kirkia 5, 33–5, 1965.
Whellan, J. A. "Quarantine bars the passage of tobacco diseases." Tobacco Forum of Rhodesia, Feb., 1965. 7–9.
Wild, H. "The African species of the genus Melanthera Rohr." Kirkia 5, 1, 1–18. 1965.
Wild, H. "The Flora of the Great Dyke of S. Rhodesia with special reference to the Serpentine soils." Kirkia, 5, 1, 49–86, 1965.
Wild, H. "Additional evidence for the Africa-Madagascar-India-Ceylon Land Bridge Theory with special reference to the genera Anisopappus Hook. f. and Arn. and Commophora Jacq." Webbia 19, 497–505.
Wild, H. "Report on the progress of the Flora Zambesiaca." Webbia 19, 905–6.
Wild, H. "Suggestions for the application of experimental techniques to species indigenous to Rhodesia and neighbouring territories in Africa." In press, Ann. Missouri Bot. Gard. 53.

SPECIALIST BRANCHES

Animal Husbandry

For the second successive year the rainfall over the greater part of Matabeleland was well below normal, and farmers in the districts of Beit Bridge, Gwanda, Matobo and Plumtree in particular suffered heavy losses.

Several relief measures were introduced to assist these producers. To minimize stock losses the Cold Storage Commission purchased over 100,000 head of drought-stricken cattle. Of this number 44,000 head of young stock, and 42,000 head of various classes of cattle, not fit for slaughter, were placed with farmers under the Commission's Cattle Agreement Scheme.

To assist beef and sheep producers to maintain their breeding herds, feed specifically bought for this purpose was subsidized at the rate of 25 per cent. of the proven purchase costs, up to certain fixed maxima for the different types of stock. In the case of dairymen, milk prices were increased by 3d. per gallon from the 1st July until the rains came.

In Mashonaland conditions were more favourable. A dry spell during the growing season lowered maize yields in certain areas, but on the whole crops were good and a record number of cattle, some 35,000 bullocks, were fattened for slaughter in the off-season. In fact, towards the end of the season all the high grade beef available for export could not be handled in the Commission's works in Salisbury. To take full advantage of the favourable export trade in beef the surplus stall-fed stock was diverted to Bulawayo for slaughter.

The Beef Industry

It is not possible at this stage to assess accurately the effects of the last two years of drought on cattle production. The figures given in Table 1, on the cattle population, show that numerically, there has been no material increase in cattle production over the past eight years. During the course of the year the statistics for the number of cattle owned by Africans in 1963 was revised and reduced from 2,227,000 to 1,873,750 head.

TABLE 1.—NUMBERS OF EUROPEAN AND AFRICAN-OWNED CATTLE IN RHODESIA
(in thousands)

Year	European-owned	African-owned	Total
1956	1,344	1,937	3,281
1957	1,434	1,981	3,415
1958	1,506	2,074	3,580
1959	1,553	2,093	3,646
1960	1,552	1,954	3,506
1961	1,599	1,988	3,587
1962	1,626	2,091	3,717
1963	1,624	1,873	3,497
1964	1,627	1,916	3,543

From Table 1 it will be seen that while the number of European-owned cattle increased from 1,344,000 in 1956 to 1,627,000 at the end of 1964—mainly as a result of purchases from the heavily overstocked African areas—the total number of cattle in the country has remained fairly constant around 3,500,000 head. This suggests that cattle numbers have reached saturation point under the existing grazing conditions and systems of extensive stock rearing.

The possibilities of producing stock feeds in the Tribal Trust Areas are extremely limited and to increase production, stock rearing must obviously be intensified in the European areas.

To encourage Africans to produce young stock that can be fattened elsewhere it was decided to investigate the possibilities of purchasing young stock on an age and weight basis at the cattle sales organized by the Ministry of Internal Affairs. In terms of an old agreement with the Ministry of Internal Affairs the Cold Storage Commission has always purchased selected young stock from Africans at an agreed price. This was fixed at 57s. 6d. per 100 lb. liveweight from 1st January, 1965, for animals varying in weight from 350 lb. to 750 lb.

During the course of the year mouthing races were erected at several sale pens and where these were available young stock were subdivided into those with milk teeth and those with two to six permanent incisors. The maximum weight limit for these classes was removed, but a minimum weight of 275 lb. for milk teeth and 350 lb. for two to six teeth animals was imposed. 62s. 6d. per 100 lb. liveweight was paid for milk teeth animals and 55s. per 100 lb. for those with two but not more than six permanent incisor teeth.

This system of sale proved increasingly popular with African producers. During the first eight months of the year a total of 1,401 milk teeth and 3,545 two to six teeth animals were sold at the 17 sale pens where animals could be mouthed. As a result it has been decided to install mouthing races at all sale pens.

This is without question one of the most promising steps yet taken to make African producers appreciate the value of increasing turnover of livestock, since organized sales were first introduced some 20 years ago. However, this system of selling cannot be regarded as a permanent measure for increasing production unless it is accompanied by an improvement in livestock management and nutrition.

The widely advocated policy of producing store cattle on European ranches for fattening in the cropping areas is questionable, particularly when it is considered that under this system the winter grazing is very inefficiently utilized owing to an acute shortage of protein-rich feeds. These problems are being investigated and in the planning of irrigation farming in the lowveld special emphasis is being placed on the production of protein-rich feeds, such as cotton, groundnuts and high quality fodders, etc., which can be transported to the ranching areas for supplementing the natural grazing.

Supplies of Slaughter Stock

The numbers of cattle slaughtered by the Cold Storage Commission and private butchers in the prescribed areas over the past five years, together with the total number of cattle killed for consumption in the country are given in Table 2.

TABLE 2.—NUMBER OF CATTLE SLAUGHTERED IN PRESCRIBED AND UNCONTROLLED AREAS
(excluding subsistence slaughterings)

Year	C.S.C., prescribed areas	Private butchers, prescribed areas	Uncontrolled areas	Total
1960	239,991	34,821	82,583	357,395
1961	221,672	37,721	82,360	341,753
1962	242,957	31,149	78,002	352,110
1963	253,957	34,298	79,805	368,060
1964	254,692	36,731	72,931	364,354

From Table 2 it will be seen that, while the slaughterings of the Cold Storage Commission and private butchers in the prescribed areas showed a relatively small increase over the past two years, the downward trend in slaughterings continued outside the prescribed areas. The pronounced drop in kills in the smaller centres from 79,805 in 1963 to 72,931 in 1964 may be due partly to the drought, but must in the main be ascribed to the fact that more and more country butchers have come to rely upon the Cold Storage Commission for their beef supplies.

An analysis of the numbers and grades of cattle slaughtered by the Cold Storage Commission and private butchers in the prescribed areas for the period ending 30th September, 1965, is given in Tables 3 (a) and 3 (b).

TABLE 3 (*a*).—NUMBER OF CATTLE SLAUGHTERED BY THE COLD STORAGE COMMISSION FOR THE YEAR ENDED 30TH SEPTEMBER, 1965

Grade	*Oxen*	*Cows and heifers*	*Bulls*	*Total, 1965*	*%*
Rhodesia's Best	11,606½	629½	—	12,236	4·6
Imperial	25,235	1,126½	—	26,362	9·9
Standard A	53,456	5,396½	—	58,852½	22·2
G.A.Q.	46,509½	26,853½	—	73,363	27·7
F.A.Q.	27,003½	16,870	—	43,873½	16·6
Compound	18,584	14,022	6,169½	38,775½	14·1
Inferior	3,242	7,909	367½	11,518½	4·3
TOTAL	185,637	72,807	6,537	264,981	100·0

TABLE 3 (*b*).—NUMBER OF CATTLE SLAUGHTERED BY PRIVATE BUTCHERS IN THE CONTROLLED AREAS FOR THE YEAR ENDED 30TH SEPTEMBER, 1965

Grade	*Oxen*	*Cows and heifers*	*Bulls*	*Total, 1965*	*%*
Rhodesia's Best	128	45	—	173	0·5
Imperial	705	198	—	903	2·6
Standard A	2,926	1,308	—	4,234	12·3
G.A.Q.	4,077½	7,328½	—	11,406	33·1
F.A.Q.	2,154½	4,930	—	7,084½	20·6
Compound	1,597	5,700½	1,451	8,748½	25·4
Inferior	149	1,693	58	1,900	5·5
TOTAL	11,737	21,203	1,509	34,449	100·0

These figures are very similar to those for 1963 (submitted last year). Despite the drought, however, approximately 2 per cent. more Imperial carcasses and a correspondingly smaller number of animals in the Standard A and G.A.Q. grades were delivered to the Cold Storage Commission during the current year. Furthermore, it can be seen that over the period under review a total of 94,010 cows and heifers were slaughtered by the Commission and private butchers in the prescribed areas. This constitutes a drop of 11,235 in female slaughterings compared with the previous year's kill.

Sheep

The increases recorded in European- and African-owned sheep populations from 1960 to 1964 are given in table 4.

TABLE 4.—NUMBER OF EUROPEAN- AND AFRICAN-OWNED SHEEP IN RHODESIA
(in thousands)

Year	*European-owned*	*African-owned*	*Total*
1960	188	131	319
1961	201	161	362
1962	209	179	388
1963	204	183	387
1964	207	186	393

As predicted last year, the drop recorded in the number of European-owned sheep from 209,000 in 1962 to 204,000 in 1963 did not signify any permanent downward trend in European sheep production. From Table 4 it will be seen that during the period under review the number of European-owned sheep increased from 204,000 in 1963 to 207,000 in 1964 while over the same period the number of African-owned sheep increased from 183,000 to 186,000.

The figures given in Table 5 show that the drop in sheep numbers on European farms the previous year was due mainly to a reduction in the number of ewes, while the increase in their total sheep numbers during the past year may be ascribed to a very noticeable improvement in lambing percentage.

TABLE 5.—FLOCK COMPOSITION OF EUROPEAN-OWNED SHEEP

Type	Year 1962	1963	1964
Rams	11,066	3,941	3,663
Ewes	127,877	121,644	120,898
Lambs	54,039	53,055	56,938
Hoggets and wethers	22,770	25,563	25,684
Lamb population as percentage ewe population	42·3	43·6	47·1

From Table 5 it will be seen that during the past year the number of lambs expressed as a percentage of the ewe population increased by almost 4 per cent. compared with earlier year's figures—which varied around 40 per cent. to 43 per cent. This satisfactory increase in sheep production can be ascribed primarily to an improvement in management and in this connexion increasing numbers of farmers are providing their breeding stock with supplementary feed during the winter.

Similarly, when compared with the previous year's slaughtering the figures given in Tables 6 (a) and 6 (b) show not only a marked increase in the numbers of sheep killed but also a noticeable improvement in the number of super lambs slaughtered by both the Commission and private butchers.

TABLE 6 (*a*).—NUMBERS AND GRADES OF SHEEP SLAUGHTERED IN THE CONTROLLED AREAS OF RHODESIA FOR THE YEAR ENDED 30TH SEPTEMBER, 1965

Commission slaughterings

Lamb	Number	Per cent.	Mutton	Number	Per cent.	Rams
Super	1,110	8·7	Mutton 1	6,515	28·3	—
Lamb 1	2,942	23.1	Mutton 2	5,116	22·3	—
Lamb 2	7,711	60·6	Mutton 3A	6,726	29·3	—
Lamb 4	973	7·6	Mutton 3B	2,445	10·6	—
			Mutton 4	2,179	9·5	—
TOTAL	12,736	100·0		22,981	100·0	1,001

Butcher slaughterings

Lamb	Number	Per cent.	Mutton	Number	Per cent.	Rams
Super	313	5·3	Mutton 1	3,510	27·9	—
Lamb 1	874	14·7	Mutton 2	2,763	22·0	—
Lamb 2	4,118	69·1	Mutton 3A	3,225	25·7	—
Lamb 4	650	10·9	Mutton 3B	1,978	15·7	—
			Mutton 4	1,093	8·7	—
TOTAL	5,955	100·0		12,569	100·0	1,117

TABLE 6 (*b*).—NUMBERS AND GRADES OF SHEEP SLAUGHTERED IN THE CONTROLLED AREAS OF RHODESIA FOR THE YEAR ENDED 30TH SEPTEMBER, 1964

Commission slaughterings

Lamb	Number	Per cent.	Mutton	Number	Per cent.	Rams
Super	820	7·1	Mutton 1	5,352	27·2	—
Lamb 1	2,700	23·4	Mutton 2	3,676	18·7	—
Lamb 2	6,814	58·9	Mutton 3A	5,297	26·9	—
Lamb 4	1,227	10·6	Mutton 3B	2,646	13·5	—
			Mutton 4	2,683	13·7	—
TOTAL	11,561	100·0		19,654	100·0	763

Butcher slaughterings

Lamb	Number	Per cent.	Mutton	Number	Per cent.	Rams
Super	299	3·9	Mutton 1	4,215	30·7	—
Lamb 1	1,109	14·8	Mutton 2	2,975	21·7	—
Lamb 2	5,195	69·3	Mutton 3A	3,573	26·0	—
Lamb 4	900	12·0	Mutton 3B	1,787	13·0	—
			Mutton 4	1,177	8·6	—
TOTAL	7,503	100·0		13,727	100·0	1,705

Pigs

The increases recorded in the number of European- and African-owned pigs from 1960 to 1964 are given in Table 7.

TABLE 7.—NUMBERS OF EUROPEAN- AND AFRICAN-OWNED PIGS IN RHODESIA
(in thousands)

Year	European-owned	African-owned	Total
1960	62	42	106
1961	70	42	112
1962	70	63	133
1963	64	66	130
1964	66	66	132

From Table 7 it will be seen that the number of European-owned pigs increased from 64,000 in 1963 to 66,000 in 1964, while the number of African-owned pigs remained unchanged at 66,000 head.

The numbers and grades of pigs slaughtered over the past year by Colcom Product Central Co-operatives Ltd. and private butchers are given in Tables 8 (a) and 8 (b).

TABLE 8 (*a*).—NUMBER OF PIGS SLAUGHTERED BY COLCOM PRODUCTS CENTRAL CO-OPERATIVES LTD.
1964–65

Grade	Baconers	Porkers	Cutters	Under wt. pigs	Over wt. pigs	Sows	Boars
A	44,376	12,169	2,857	—	—	3,516½	342
B	7,016½	3,536	2,241	203	—	515	48
C	1,842	—	—	—	—	—	—
L	2,369	1,775	195	168	—	—	—
X	2,311½	5,840	4,229	1,686	—	—	—
Inferior	97	1,112	292	1,641	—	127	—
TOTAL	58,012	24,432	9,814	3,698	1,382½	4,158½	390

Total for year ending 30th September, 1965: 101,887
Total for year ending 30th September, 1964: 105,734

TABLE 8 (*b*).—NUMBER OF PIGS SLAUGHTERED BY PRIVATE BUTCHERS IN THE CONTROLLED AREAS, 1964–65

Grade	Baconers	Porkers	Cutters	Under wt. pigs	Over wt. pigs	Sows	Boars
A	457	2,169	1,491	—	—	999	—
B	86	1,425	807	371	—	366	—
C	21	—	—	—	—	—	—
L	31	149	84	60	—	—	—
X	1,174	7,365	3,688	3,573	—	—	—
Inferior	91	1,289	247	1,972	—	33	—
TOTAL	1,860	12,397	6,317	5,976	—	1,398	—

Total for year ending 30th September, 1965: 27,948
Total for year ending 30th September, 1964: 32,841

From Tables 8 (a) and 8 (b) it will be seen that over the past year 8,740 less pigs were slaughtered than in the previous year. An examination of the figures show that the drop occurred mostly in the X grade porkers and cutters. This would seem to indicate that African pig production may have dropped as a result of the drought, unless more pigs were slaughtered for consumption in the Tribal Trust Areas.

General

As in the past, this Branch co-operated closely with the Ministry of Internal Affairs in grading the cattle for sale at the weight and grade sales. Also, the grading staff assisted the Pig Industry Board in testing the efficiency of intra-scope grading.

DAIRY

Dairying Season

Drought conditions prevailed over most of the territory and was particularly severe in Matabeleland and the Midlands. Yields of maize grain were appreciably reduced in the recognized higher rainfall maize growing areas and in many other areas crops were a complete failure. Absence of conserved fodder and home grown concentrate feed made the position extensively difficult and costly for many dairy farmers and was a severe blow after experiencing similar conditions in the previous season.

Production of Dairy Produce

The effect of two consecutive years of drought was to reduce the normal rate of expansion of milk production. Whereas in recent years average annual increase in milk production has been in the region of 750,000 gallons per annum, the increase this year over the preceding year was only 1.3 per cent. or 300,000 gallons.

Butterfat supplies from cream producers was at a slightly higher level than last season and represented approximately half of the butterfat used for butter manufacture. The balance of butterfat intake at Creameries was obtained from whole milk separation by the Dairy Marketing Board to meet the demands for skim milk, cultured fat reduced milk, and other skim milk products.

Butter production was slightly less than in the 1963–64 season, but was more than adequate to meet domestic needs. The comparatively small surplus was disposed of without difficulty in neighbouring territories, particularly the Republic of South Africa.

Sales of whole milk within prescribed areas continued to decline, but the rate of decrease was considerably less than in recent years. Sales in African areas showed very little signs of improvement after last year's boycott. On the other hand sales of cultured milk continued to expand. The introduction of "Creamed Lacto", containing one per cent. butterfat in place of the skim milk product, proved popular, and in spite of a price increase from 4d. to 6d. per pint the demand continued. Apart from improving the nutritional value of the cultured product the change-over reduced the volume of surplus butterfat for butter manufacture which would have had to be disposed of on the export market at competitive prices.

Substantial importations of skim milk powder were necessary to satisfy the local demand. The effect of price increases and transfer of the small pack trade to private enterprise, referred to in last year's report, could not be assessed with accuracy, but it would appear from Dairy Marketing Board sales that sales have declined.

Milk utilized by Nestles for the manufacture of whole milk powder and infant foods showed a substantial increase as compared with previous years. A ready demand for their products in neighbouring territories, particularly the Republic of South Africa, accounted to a large extent for the increased requirements of milk.

Production figures for the main commodities are given in Table 1. These figures do not include butter and cheese produced on farms which are relatively small.

TABLE 1.—DAIRY PRODUCTION, 1920–65

Year	*Butter* (1,000 *lb.*)	*Cheese* (1,000 *lb.*)	*Milk used for dried milk* (1,000 *gals.*) (*a*)	*Liquid milk* (*b*)	*Total* (1,000 *gals.*)
1920	600	79	—	258	2,000
1930	1,768	163	—	1,008	6,100
1940	1,686	383	—	2,095	6,910
1950	900	394	—	5,720	9,000
1960–61	2,899	1,704	2,974	9,353	19,300
1961–62	3,074	1,845	3,859	9,690	20,700
1962–63	2,984	2,240	3,773	9,518	21,000
1963–64	3,037	2,882	4,798	9,436	22,604
1964–65 (*c*)	2,919	2,625	4,949	9,326	22,904

(*a*) Milk used for skim milk powder, whole milk powder and infant foods.
(*b*) Milk available for liquid milk, fresh cream and ice-cream.
(*c*) Preliminary figures.

The number of suppliers to the Dairy Marketing Board continued to decrease and milk intake increased by only 2 per cent. as compared with the previous year's intake. This latter figure was considerably less than the comparative figure for the previous season of 8.2 per cent. Average daily production per farm continued to increase and attained 99 gallons, as compared with 93 gallons in the previous season.

There were marked differences in the intake pattern at the various Dairy Marketing Board milk receiving centres. At Bulawayo intake dropped by 8.3 per cent. as compared with the previous season. A drop of 4.1 per cent. was also recorded at Umtali. At Gwelo and Gatooma, on the other hand, milk intake increased by 9.7 and 19.1 per cent. respectively. The position at Salisbury was fairly stable, having an increased intake of 4.1 per cent.

TABLE 2.—DAIRY MARKETING BOARD

Year	*No. of suppliers* (*August*)	*Total milk supplied* (1,000 *gals.*)
1955–56	403	8,852,000
1960–61	525	14,307,000
1961–62	527	15,236,000
1962–63	502	15,472,000
1963–64	491	16,745,000
1964–65	475	17,081,000

Creameries: Butter Production: Consumption

Butter was manufactured at Umtali, Salisbury and Gwelo and also small quantities on farms in remote areas. Production figures are given in Table 3, but do not include farm production.

TABLE 3.—PRODUCTION AND APPARENT CONSUMPTION OF BUTTER

Year	Production (1,000 *lb.*)	Apparent consumption (1,000 *lb.*)	(−) *Shortfall met by importation* (+) *Surplus* (1,000 *lb.*)
1950–51	767	2,643	−1,876
1960–61	2,899	3,265	−366
1961–62	3,074	3,200	−126
1962–63	2,984	3,250	−266
1963–64	3,037	2,900	+137
1964–65	2,919	2,700	+219

Butter production was slightly less than in the corresponding period of last year but exceeded the apparent consumption for the territory. Surplus was exported to neighbouring territories, mostly to the Republic of South Africa.

Butterfat prices for the period under review were as follows. Butterfat producers, however, received an additional 2d. per lb. on 1st and 2nd grade Butterfat supplied until the 30th June, 1965. This was paid by the Dairy Marketing Board from the Butter Price Stabilization Fund.

MINIMUM BUTTERFAT PRICES

(*per lb.*)

	1st Grade cream	*2nd Grade cream*
1st December to 31st March	3s. 4d.	3s. 0d.
1st April to 31st May	3s. 8d.	3s. 4d.
1st June to 30th November	4s. 0d.	3s. 8d.

Maximum retail prices for butter remained unchanged and were as follows:

1st Grade: 4s. 1d. per lb.
2s. 1d. per ½ lb.
2nd Grade: 3s. 11d. per lb.
2s. per ½ lb.

There was no control on other grades of butter or butterfat.

All butter was graded before sale and comparative figures as a percentage of total production over a number of years are given in Table 4.

TABLE 4.—BUTTER GRADES AS PERCENTAGE OF TOTAL MANUFACTURE

Year	*First Grade* (*per cent.*)	*Second Grade* (*per cent.*)	*Third Grade* (*per cent.*)
1960–61	93·0	5·0	2·0
1961–62	90·0	8·0	2·0
1962–63	87·0	11·0	2·0
1963–64	87·0	11·0	2·0
1964–65	87·0	12·0	1·0

The sale of unsalted butter to a local manufacturer producing margarine containing 10 per cent. butter continued and was supplied from Salisbury Creamery.

Cheese Factories: Cheese Production: Cheese Consumption

Six cheese factories were registered for cheese manufacture, but manufacture at Salisbury was seasonal and confined to the flush intake period. The cheese factory at Shabani specializing in the production of Hallumi varieties of cheese continued in production for only a short period and is no longer in operation.

Most of the cheddar cheese continued to be manufactured at Bulawayo and Chipinga and, with the seasonal production at Salisbury, catered for the local market. Production at Chipinga remained at the same level as in the previous year.

Cheese production at Umtali and Gatooma was largely confined to one variety at each centre. Umtali Dairy specialized in the manufacture of the Gouda variety and Gatooma Roquefor cheese.

Other varieties of cheese produced were Cheshire, Cream and Cottage cheese and Processed cheese. Production of these varieties increased appreciably and, although sales were small in comparison with Cheddar and Gouda varieties, they succeeded in arresting the tendency for a decline in the consumption of locally produced cheese.

Exports of cheese to neighbouring territories continued and was mostly in the form of Gouda cheese to the Republic of South Africa.

Quality of Cheddar cheese was maintained and grading figures over a number of years are given in Table 5. Although Cheddar cheese is the only graded variety, quality of other varieties was also good and is confirmed by the success of the Dairy Marketing Board entries at the Rand Easter Show. The Dairy Marketing Board were successful in gaining five first prizes, three second prizes and four third prizes in the Cheddar and Gouda classes and also second prizes for their Cheshire and Processed cheese entries.

TABLE 5.—CHEDDAR CHEESE GRADING AS A PERCENTAGE OF TOTAL CHEESE GRADED

Year	*First Grade (per cent.)*	*Second Grade (per cent.)*	*Third Grade (per cent.)*
1960–61	93·5	5·8	0·7
1961–62	97·0	2·8	0·2
1962–63	96·7	3·1	0·2
1963–64	96·1	3·9	0·0
1964–65	97·1	2·8	0·1

Wholesale prices of cheese remained unchanged except for the Roquefort variety which was increased from 3s. 9d. to 4s. 3d. per lb. Wholesale price for Cheddar and Gouda cheese was 2s. 11d. per lb., Processed cheese 3s. 3d. per lb. in blocks, and Cheshire cheese 3s. 11d. per lb.

The apparent consumption of cheese in the territory is estimated to be 2,800,000 lb.

Milk Supplies and Milk Prices

As indicated earlier in this report, milk intake by the Dairy Marketing Board showed very little increase over the corresponding period of last year. Surplus for manufacture increased slightly and represented 61.7 per cent. of the total milk intake as compared with 59.5 per cent. for the corresponding period of last year. This trend is not favoured by producers as the consequences are normally lower milk prices.

Until July, 1965, producer prices were calculated according to the recognized formula, the net realization value for surplus milk being controlled at 22.2d. per gallon. Subsequently, a number of major changes were introduced, details of which are given in the Dairy Produce Marketing and Levy (Dairy Product Prices) (Amendment) Regulations, 1965 (No. 5) (R.G.N. No. 521 of 1965). The first important change in policy was the discontinuation of payment of guaranteed seasonal prices for the 62,500 gallons of milk over and above whole milk sales, a quantity frequently referred to as the "safety margin". The other important change was the limit placed on the amount of money available for the payment of quality premium under the milk quality payment scheme.

At the same time legislation was also introduced increasing the retail price of whole milk in prescribed areas by 1d. per pint (R.G.N. 466 of 1965). Producers were naturally very concerned at the effects of these changes on producer prices, particularly if consumer resistance resulted in a marked drop in the whole milk sales within prescribed areas. The effect of decreased sales had, however, been considered in the preparation of producer price legislation and producers were guaranteed in the price calculation a level of whole milk sales equivalent to quantities sold in the corresponding period of the previous year. In the event of whole milk sales exceeding those of the previous year legislation also provided for the payment of a supplementary payout.

The overall effect of the amendments to legislation dealing with producer and retail prices for milk was that the Dairy Marketing Board had to pay producers for milk on the amended basis of calculation and were responsible for the payment of quality premium for milk within the limits prescribed, and were expected to continue to operate without the assistance of subsidy.

The milk intake and apparent consumption of whole milk within the prescribed areas, and prices paid to producers for milk supplied to the Dairy Marketing Board over the past two years, are given in Tables 6 and 7 respectively.

TABLE 6.—DAIRY MARKETING BOARD

Year	*Total milk intake* (1,000 gals.)	*Apparent consumption as whole milk* (1,000 gals.)	*Surplus over whole milk requirements* (1,000 gals.)
1960–61	14,307	7,162	7,145
1961–62	15,236	7,154	8,082
1962–63	15,472	7,036	8,436
1963–64	16,745	6,783	9,962
1964–65	17,081	6,710	10,371

TABLE 7.—DAIRY MARKETING BOARD

Month	Standard price (per gal.)	Actual average payout without quality bonus (per gal.)	
	1964–65	1963–64	1964–65 (a)
October	51	36·1	35·9
November	51	34·6	35·5
December	37	27·1	27·8
January	37	27·1	27·4
February	37	28·1	28·4
March	47	33·4	33·4
April	47	34·2	33·4
May	47	33·2	33·9
June	47	33·9	34·2
July	51	36·1	34·0
August	51	35·6	33·5
September	51	35·6	33·7

(a) Prices from July onwards are subject to adjustment when actual average realization value for surplus milk is determined by the Dairy Marketing Board.

Fresh Cream

The demand was met by producer retailers and the Dairy Marketing Board. Sales by the Dairy Marketing Board continued to increase but a reliable estimate of actual total consumption from all sources is not available.

Dried Milk Powder

As mentioned in last year's report, the Dairy Marketing Board were granted a monopoly for the importation of skim milk powder in bulk, and the local industry was protected against importation of small packs by the introduction of an effective duty. At the same time the Dairy Marketing Board discontinued production of small packs and this operation was taken over by private enterprise. The wholesale price of milk powder was increased at this stage to 1s. 3d. per lb. in the case of Roller Dried skim milk powder and 1s. 9d. per lb. for Spray Dried skim milk powder.

The effect of these changes was difficult to assess in the initial stages but it later became apparent that sales of skim milk powder were declining and was a matter of concern to the Dairy Marketing Board. Consumer resistance on account of price increases and lack of supply in rural areas were considered to be the probable causes. It was at one stage considered that the Dairy Marketing Board should re-enter the small pack trade to recover the market but finally it was agreed to permit the Dairy Marketing Board to sell 5 lb. packets and that 50 lb. bags should be available at the wholesale price of 1s. 9d. per lb. Small traders could then take advantage of the opportunity of purchasing smaller quantities at 1s. 9d. per lb.

Supplies of whole milk to Nestles increased from 2,174,000 gallons in 1963–64 to 2,929,000 gallons in 1964–65. In addition to converting this volume of milk into full cream whole milk powder and infant foods, they also commenced manufacture of 'Instant Skim Milk Powder' and produced 160 short tons of skim milk powder on behalf of the Dairy Marketing Board. Disposal of the increased volume of products produced was largely accounted for by exports to neighbouring territories, in particular the Republic of South Africa.

Cultured Milk and Skim Milk

Sales of cultured milk, mainly in the form of Creamed Lacto containing 1 per cent. butterfat, increased and exceeded 1,000,000 gallons. This product was purchased almost exclusively by the African, mostly in urban areas.

Sterilized Milk

This product was produced by the Dairy Marketing Board at Bulawayo. Sales were disappointing and continue to decline. Reduced demand from neighbouring territories and greater availability of pastuerized milk in rural areas are factors which were probably responsible for the decreasing popularity of this product.

Ice-cream and other Frozen Confections

The two main suppliers were the Dairy Marketing Board and Lyons. Sales by the Dairy Marketing Board increased but no reliable estimate of total consumption is available. During the period under review sales by the Dairy Marketing Board to Zambia discontinued on account of the imposition of an import tariff by the Zambian Government.

Dairy Bonus Scheme

Notice of termination of this Scheme was referred to in last year's report, and 1964–65 was the first season in which the reduced rates of bonus were paid. The rates of bonus payable until the Scheme expires in November, 1967, are as follows.

Period	Butterfat (pence per gal.) 1st Grade	Butterfat (pence per gal.) 2nd Grade	Milk for cheese Manufacture (pence per gal.)
1st December, 1964 . . . } 30th November, 1965 . . . }	9d.	6¾d.	4½d.
1st December, 1965 . . . } 30th November, 1966 . . . }	6d.	4½d.	3d.
1st December, 1966 . . . } 30th November, 1967 . . . }	3d.	2¼d.	1½d.

Milk Recording

The trend over the past few years for the number of milk recorded herds to decrease has been arrested. During the year 21 producers withdrew from the scheme but were replaced by the same number of new participants.

Analysis of lactation records progressed satisfactorily and two investigations were completed, both of which are in the final stages of preparation for publication.

The following Tables 8 and 9 give the production figures for winners of competitions and average production per cow on test respectively in recent years. The 1963–64 figures show an increase of 28 gallons in average milk yield over the previous year.

TABLE 8.—PRODUCTION OF WINNING HERDS IN MILKING COMPETITION
(Average of the best 15 cows in the herd)

Year	Milk Section (lb.)	Butterfat Section (lb.)
1960–61	16,272	593·3
1961–62	17,077	606·5
1962–63	17,802	600·0
1963–64	18,099	639·0

TABLE 9.—AVERAGE PRODUCTION PER COW: PEDIGREE AND GRADE HERDS

Year	No. of lactations	Average milk production per cow (lb.)	Average Butterfat production per cow (lb.)	Average Butterfat per cent. per cow	Average days in milk
1960–61	11,825	6,746	270·6	4·01	275
1961–62	11,710	6,768	264·1	3·90	280
1962–63	10,515	6,885	281·6	4·09	280
1963–64	9,716	7,168	293·0	4·08	280

Investigations

Investigations undertaken during the year included the analysis of milk records and the operational efficiency of milking machines which are still continuing.

It was established that our lactation records are suitable for analysis by statistical techniques.

The first analysis was carried out to obtain an overall picture of the effects of geographical areas, years and breeds. Significant interactions were found between area and breed for milk yield, butterfat yield and lactation length.

An investigation of lactation length showed that the area ⊠ breed interaction was responsible for the interaction in the other two factors. The regression of milk yield and butterfat yield on lactation length included a strong quadratic influence with differences in effect between the two breeds studied.

An investigation is being carried out on the relationship between blood serum Beta-transferrin types and production ability.

A preliminary contemporary comparison was carried out on the records of daughters out of local cows of a proven bull standing at an A.I. centre in England. The animals which have completed records are performing well.

In view of the increased popularity of machine milking a service enabling the mechanical efficiency of milking machines to be tested, was introduced. The initial survey, in which 70 installations were tested,

indicated that the majority of machines were inefficient and only 4 per cent. were found to be in an entirely satisfactory mechanical condition. However, follow up visits to selected farms suggest that most farmers rectified the faults diagnosed and many have reported improvements in labour utilization, milk yield and a reduction in udder disease.

General

Owing to continued expansion of milk production and the increasing difficulty of coping with surplus milk particularly during the flush intake periods, the Dairy Marketing Board decided to install a new milk spray drying plant at Salisbury. Work on the project has already commenced and the plant is expected to be in operation by the next peak intake period. This installation will provide facilities for a substantial increase in skim milk powder production and reduce our dependence on imports to meet the local demand for this product.

The Dairy Marketing Board's policy of extending sales activities into the lowveld proved successful and sales of milk and Lacto continued to increase in this area. Various schemes were also initiated to boost sales in the urban African areas. Pilot schemes are being introduced in the Salisbury area and if successful will be extended to townships at other centres.

POULTRY

Production

During the year under review the production of all poultry products, eggs, table poultry and day old chicks for stock replacement has supplied all requirements of the market available and some export has been achieved, particularly in chick production, which has increased.

The general trend reported last year of larger specialized units and a reduction in sideline production, has continued, with the result that fewer but better managed and more efficient units are producing the same quantity of products, generally at lower cost and of better quality.

The prices received by producers for eggs have been better than for the last two seasons, but prices for broilers have remained low, allowing a margin of only 1d. to 3d. per lb. over average cost of production where all purchased feed is used.

The demand for the roaster type of table bird of approximately 4 lb. dressed weight has increased, however, and some producers are finding it more profitable than the broiler production.

Day old chick production has increased, due largely to increased exports, and prices have remained steady. The hybrid layer stocks available locally from franchise holders predominate in sales and progeny of imported broiler stocks now completely dominate sales in that class of stock.

Exports

Exports of day old chickens to 11 African territories amounted to 1,250,000, valued at £120,000. This figure may drop, however, in future, as Zambia, the largest importer, is increasing production from the branches of Rhodesian breeders established there.

Poultry meat was exported to four main territories, and here again Zambia was by far the largest importer. Exports to this territory have now largely ceased. Exports were 400,000 lb., value £60,000.

Eggs were exported to the same four territories and the same position applies, though some trade with Zambia is still taking place. Export of eggs was 200,000 doz., value £34,000.

However, the general outlook for increased exports of poultry products is not favourable and it would appear it may be difficult to maintain present export figures. It is therefore necessary to look to increased local consumption of poultry products for expansion.

Imports

The only imports of poultry products amounted to a few thousand grandparent breeding stock chicks for breeders' requirements. No commercial products for consumption were imported.

Marketing

The marketing of poultry products has not changed, though competition has forced improvements in presentation and voluntary grading.

The Rhodesian Chicken Co. imported modern poultry dressing equipment from Denmark and has thus established a modern processing plant in Salisbury, which is supported by some 20 of the larger producers.

The necessity for improvement in marketing as suggested by the Committee of Inquiry of 1963 has been recognized by Government.

This Ministry has been active in drawing up regulations under the Control of Goods Act to assist in this respect. It is considered desirable in the first instance to provide for three main regulations. These are the registration of producers, the grading of eggs, and the enforcement and better control of the regulations already in force in respect of poultry dressing establishments.

Due regard has been paid to the interests of small producers who keep poultry for their own use and who may sell direct to consumers, and they will not suffer from these regulations if adopted. Prescribed areas are also envisaged and therefore only the main selling areas will be affected. Proper grading of products will increase sales and be of benefit to both producer and consumer. These proposed regulations are ready for decision by Government and it is hoped may be gazetted early next year. The consideration of these proposals has occupied a considerable amount of time during the year by this branch.

Departmental

During the year it was decided to close down poultry work at Matopos Research Station because one station where poultry experimental work is carried out was considered sufficient and also because professional staff could not be found. The work at Matopos, comprising broiler trials and egg production trials under different lighting regimes, was stopped during the year and only the section of the Random Sample Egg-laying Trial will run until this is completed on December 31st.

All educational and research work with poultry will therefore be concentrated at Gwebi College, where staff is available and extra facilities will be provided.

Egg Laying Test: Gwebi College

The first Random Sample Egg-laying Test to be held in Africa was run at Gwebi and Matopos from February 1st, 1964, to December 31st, 1964. It consisted of a 40-pullet random sample pen team, picked as day-old pullets from the breeders' incubators. Accommodation was available for ten teams. The results were excellent, the winning team averaging 241 eggs per bird at a conversion rate of 3·77 lb. of feed per 24 oz. doz. eggs produced. These figures are better than most tests elsewhere and indicate that the best laying stock is available to producers here and fully justifies the decision made in 1959 to allow hybrid-type laying stock to be introduced into Rhodesia. The results were published in the March-April issue of the Rhodesia Agricultural Journal.

The Second Random Sample Test commenced with day-old pullets taken in August, 1964, and will run until December 31st, 1965. To date, results are good, though slightly lower than last year, but again showing the superiority of the hybrid or strain cross layer. Day old pullets for the third test are now growing at Gwebi College, where the full test will be held commencing February 1st, 1966. Results have been and will be published quarterly for the benefit of the breeders, producers and general public.

Gwebi College: Experimental Work

During the year the following projects were undertaken or are in progress at Gwebi College:

(a) *Lighting Trial*

The object of this trial was to determine the interaction of three rearing lighting regimes (step down, a 14½-hour light and natural daylight hours) upon subsequent laying lighting regimes (constant 18 hours light and step up to 18 hours light). The experiment lasted for 40 weeks. There is an indication that the 14½-hour constant rearing light regime produced the best results; this, however, will be confirmed when results are analyzed statistically and published. This experiment will be repeated with different stock.

(b) *Protein Trial*

The object of this experiment was to estimate the highest level of maize and the lowest level of protein that will constitute an acceptable laying ration. This was run for 28 weeks, but as the stock used (station crossbreds) were not genetically capable of very high production, little significant difference was indicated and the trial was stopped, but is to be repeated with strains of high-producing hybrids.

(c) *Calcium Trial*

This trial was started in an endeavour to ascertain more accurately the calcium requirements of layers. This trial was also abandoned because the low production gave no significant results.

(d) *Broiler Trial*

This was run with 200 broiler type chickens to 10 weeks of age to see whether stabilized fat (tallow) could be substituted for maize in the ration to increase the energy more economically. It was found that at the present price of maize and tallow the latter would have to be reduced £20 to £25 per ton in order to justify its use in broiler rations in Rhodesia. These results will be published shortly.

(e) *Pigmentation Trial*

Yolk colour is affected a great deal by the quality of the feed, particularly the xanthophyll content of lucerne meal. This feed varies a great deal in quality and therefore this experiment, with synthetic carotenoid pigments (caraphyll 10 and canthaxanthin), was undertaken to find out what levels in the diet would produce a yolk colour acceptable to the public. This is still in progress.

(f) *Energy Trials*

Total energy and metabolizable energy values of Rhodesian-grown cereals for poultry feeding are not known. Trials were made with chickens using maize, sorghum and munga and the values calculated. This trial will be repeated and results published.

(g) *Sorghum Trial*

A trial is in progress using sorghum as a replacement for maize for egg production in varying amounts.

This experimental work is being carried out by Mr. A. J. Smith of the University College on an arrangement made with this Ministry.

Educational Work

The 1964 first-year students at Gwebi were given a reduced syllabus of 15 lectures on Poultry Husbandry by Mr. Smith, of the University College, but the practical instruction on this subject was increased.

A short course in Poultry Husbandry was given in August to 19 farmers and prospective farmers which included lectures by experienced farmers and practical demonstrations.

At Chibero College the Animal Husbandry syllabus includes instruction in Poultry Husbandry.

Advisory Publications and Visits

A bulletin on "Force Moulting of Layers" by the Chief Poultry Officer was published in the Rhodesia Agricultural Journal for January, 1965.

A series of articles on rearing and management of poultry are being written for the Ministry of Agriculture, in collaboration with the Natural Resources Board, Information Sheet "Kunzwa" for African farmers, and two have been published to date.

Information and illustrations on Poultry Husbandry were provided to the Rhodesia Literature Bureau for their publication "The Poultry Book in Shona", which sells at 1s. 6d.

Meetings were attended of the Poultry Science Association, Standards Association Animal Foodstuffs Committee, Salisbury Poultry Club, Bulawayo Poultry Association, R.N.F.U. Poultry Committee, and visits were paid to Government and municipal health departments, agricultural shows (judging), municipal markets, agricultural co-operatives. In addition over 100 visits were paid to European and African farmers in all areas on advisory services.

Stock Feeds

No shortages occurred in the supply of ingredients for poultry rations and only slight rises in prices of certain feeds were necessary.

All poultry feed registrations were checked by this Branch and the Branch of Chemistry and Soil Science.

Veterinary

One rather serious outbreak of Fowl Typhoid in a portion of the flock of one of the largest breeders curtailed chick production on this farm because of quarantine. Losses were very few and the farm is now clear. No other major outbreaks of diseases occurred. Losses from Leucosis are still the most serious cause of mortality and respiratory diseases also cause some loss.

All breeding stocks were tested for Bacillary White Diarrhoea and certificates issued for free flocks by the Veterinary Department. All imported stock was kept in quarantine under veterinary supervision as required. No diseases were reported.

PASTURE RESEARCH

At no previous time in the recent history of Rhodesia (since the occupation) has the area of degraded grazing in the drier regions reached such spectacular proportions. A series of dry years capping the damage caused by years of overstocking and misuse has produced a landscape which over millions of acres can only be described as desert. Over enormous acreages the perennial grasses have been eliminated, while the density of the bush assisted by the removal of effective grass competition has increased, as has the harvester termite population. Harvester termites, previously occurring over much of the affected area, have in places reached

a population density at which the termites are capable of consuming all of the grass produced. Much of the damage already done is permanent and the area of damaged land is increasing. The situation is too big to be solved piecemeal by individual effort. It is a national emergency that can only be alleviated by an intensively planned and skillfully directed campaign with all of the resources of the country behind it. It is necessary that the urgency of the situation should be brought home to the people of Rhodesia. There is a general tendency to blame it all on the drought and to excuse the underlying causes, which are overstocking and bad management, on the grounds of economic necessity.

There is a great danger that a good season or a series of good seasons by temporarily hiding the scars will add to this complacency and delay any effort to do something to remedy a condition that is fast becoming incurable. If the present situation is accepted and nothing is done to alleviate it good seasons will not avert the ultimate complete collapse of the dry grazing country. Its end will come rapidly and then, as in Somaliland, the desert will be with us for all time. Economists may argue that expensive remedial measures are not warranted by the return in increased production that can be expected, but this argument does not take into consideration the effect that the growth of desert conditions over this enormous area will have on the economy of the rest of Rhodesia.

Survey of the Condition of Grazing in Tribal Trust Land

This survey began last year, has been completed and a cyclostyled report has been prepared. In this report Tribal Trust Land is classified under four condition classes: 1, Bare; 2, Very overgrazed; 3, Moderate; 4, Good.

The survey shows that *circa* 1962 the condition of grazing in Tribal Trust Land for the country as a whole was as follows:

Natural region	*Bare*	*Very overgrazed*	*Moderate*	*Good*	*Total*	*Percentage of total grazing area*
I	—	49,600	177,935	4,500	232,033	1
II	—	1,402,423	385,963	353,900	2,142,286	7
III	—	2,963,787	560,326	822,061	4,346,174	14
IV	789,226	4,883,106	2,736,889	8,047,220	16,456,441	52
V	3,301,989	2,217,352	826,596	2,096,514	8,442,451	26
	4,091,215	11,516,268	4,687,709	11,324,195	31,619,387	
Percentage of total grazing area	13	36	15	36		100

This table indicates that 49 per cent. of the veld is either very overgrazed or bare, a situation which leaves no room for complacency. Furthermore, of the balance of grazing land which is classed as in *moderate* or *good* condition, about 86 per cent. is in Natural Regions IV and V. The area in *good* condition is the larger only because it is tsetse infested and therefore ungrazed by cattle. If ever opened up to cattle, the veld in such regions would have to be stocked very lightly in order to prevent deterioration. In other words its availability as grazing land if the tsetse could be removed, would not relieve the present situation. It should be noted that the survey is based on data collected in 1962 and earlier. It is known that since 1962 the condition has deteriorated further.

Sample Survey of Grazing Land

Because it was considered necessary to investigate the trend in veld production in critical areas so that steps could be taken in time, plans were drawn up for the carrying out of a sample survey of grazing land in both farming areas and the Tribal Trust Land falling within Natural Regions III, IV and V. The objective was to measure and record veld condition in selected veld types in order to determine whether or not the veld was deteriorating with the use imposed and to demonstrate to the farmer or tribesman accordingly. Responsible for this work were the two pasture advisory officers seconded to the Department of Conservation and Extension. Unfortunately, these two posts were abolished on 1st July, 1965, with the result that the sample survey had to be abandoned after a very encouraging start had been made.

In the Midlands Province, work had been started on farms in the Que Que, Bembezaan, Battlefields and Charter I.C.As. Transects have been established and ring-barking plots treated and fenced.

In Matabeleland, two transects have been established on a ranch in the South Marula I.C.A., investigations were being planned on Insinde Ranch, Gwanda I.C.A., and work already started on Liebigs Ranch at West Nicholson had been taken over.

In the lowveld, transects were laid out and initial records made in a bush control trial at Chiredzi. Similar work was planned for two bush control trials on Nuanetsi Ranch. In addition the pasture advisory officers were responsible for assisting the Department of Conservation and Extension in veld surveys and carrying capacity assessments for farm and ranch planning and had carried out surveys of the Matopos National Park in connexion with drought relief planning and of the Kyle Game Park for the Department of National Parks and Wild Life Management.

The preliminary observations made during the year indicate that much European land in Natural Regions IV and V is little if any better than similarly situated land in Tribal Trust Areas and that the condition of European land is deteriorating very rapidly. This deterioration is largely due to increased pressure on European land caused by recent increases in the numbers of European-owned cattle. A survey to determine the present condition and trend in European land is therefore very necessary.

Revegetation of Denuded Areas: Harvester Termites and Reseeding

The vast extent of denuded country in Matabeleland has aroused considerable interest in reseeding as a means of inducing a fresh cover of grass. As a consequence this branch was requested to initiate experimental reseeding work in both European and African areas.

In order to study the problems involved and to select suitable experimental sites a reconnaissance of the denuded areas was made. This survey established that although the present disastrous condition of the country was greatly accentuated by drought, it could not be ascribed to drought alone, but to a combination of overstocking, poor management, harvester termites and drought.

The basic cause being destruction of the grass cover by overstocking and poor management, which in its train has induced a spectacular increase in the population of harvester termites, while drought has served to magnify the effects produced by overstocking and the depredations of harvester termites. It became obvious that reseeding could not be expected to succeed until the grazing pressure could be drastically reduced and the harvester termites eradicated.

It was noted that although perennial grasses high in the succession appear to have been eliminated over great areas, there was still a good supply of buried viable seed of annual and short-lived perennial, pioneer grasses, and that where sufficient rain had fallen a fair cover of annuals had resulted. This gives reason for supposing that in most areas reduction of the grazing pressure and eradication of harvester termites will be sufficient to enable a cover of pioneer grasses to establish when rain comes, without reseeding and that under light stocking and proper management this pioneer cover will improve gradually in species composition. In Natural Region V, where very low carrying capacity and uncertain rainfall severely limit the financial return from livestock, it is doubtful whether any further sreps would be economically justifiable, but on better and more productive land reseeding with suitable species following pitting with eccentric discs or some similar type of cultivation to prevent run off and to provide a lodgement for seeds, appears well worth investigating.

Beginning during the coming year investigations along these lines will become an increasingly important part of the work of the Pasture Section at Matopos Research Station and arrangements are being made for an entomologist to be stationed there to work on the harvester termite problems in the dry country.

It should be emphasized that no single measure, such as harvester termite control, bush eradication or reseeding, can be expected to solve the problem. The solution lies in adjusting the stocking rate to the productive capacity of the vegetation in a sound system of management and by assisting sound management, where necessary, with such curative measures as harvester termite control, reseeding and bush eradication.

Extension

A great effort has been made this year to provide farmers and extension officers with adequately digested information on veld and improved pastures. In doing this the aim has been to indicate the place of pasture in a developing beef industry in the sandveld and also to give detailed advice on establishment and management.

Lectures and field demonstrations were given by head office staff at three Conex farm planning courses, at two beef courses organized by the Mashonaland Province, at a four day course in veld management organized by the Pasture Advisory Officer for the Midlands Province, to students in the Zoology Department of the University College, to students at the Chibero College of Agriculture, to farmers' association and I.C.A. meetings. In addition, a talk on "Pastures for the Eastern Districts and under Irrigation" was broadcast in the N.R.B. programme. During the year the Branch co-operated in various ways with the Department of Conservation and Extension, the Department of Veterinary Services, the Department of Trypanosomiasis and Tsetse Control, the Department of Lands, the Department of National Parks and Wild Life Management, the Natural Resources Board, and the Sabi-Limpopo Authority.

Pasture Grass Seed

Although affected by drought the grass seed crop was larger than in the previous season but well below the peak which was reached in the season 1962–63. This is shown below.

	Katambora Rhodes Grass	*Giant Rhodes Grass*	*Ermelo Weeping Love Grass*	*Bambatsi Panicum*	*Sabi Pan.cum*	*Total*
1962–63	75,777	32,186	21,248	—	13,128	142,339
1963–64	39,089*	10,174	20,487	—	8,623	78,373
1964–65	63,603	5,603	21,265	—	9,940	99,991

* Figure of 29,098 given in report for year ending 30th September, 1964, was a misprint and is incorrect.

The table includes all seed, both certified and uncertified, grown in Rhodesia and sold by the Salisbury Farmers' Co-op. who are the official agents to the Rhodesia Pasture Seed Growers' Association. It does not include uncertified seed sold directly by growers or by growers through other co-ops. Interesting trends are the great drop in the production of Giant Rhodes Grass seed and a reduced local demand for the seed of Ermelo Weeping Love Grass, evidenced by the fact that most of the Rhodesia Love Grass crop was exported to the Republic of South Africa. Formerly, fairly large quantities of Love Grass seed were imported for sowing in Rhodesia.

General

An "Estimation of the carrying capacity of veld grazing within the area of the Sabi-Limpopo Authority" was prepared.

Progress is being made with the *Senecio Survey* and it is hoped that a report will be published during the coming year.

Work on the ecology of various important plant communities is being carried out as opportunity permits and the results will be published in a series of papers, the first of which should appear shortly.

A measuring instrument of a new type for the Point Centre Quarter Method of Botanical Analysis has been designed by the Senior Pasture Research Officer and the Biometrition. It is being used in the analysis of the veld experiments at the Matopos Research Station, where this method is proving particularly well suited for use in veld with a sparse cover.

A very successful conference of Pasture Research Workers was held at Henderson Research Station in April.

Grasslands Research Station

Difficulties experienced in producing seed of the *Paspalum spp*. advocated by Grasslands need to be solved if the grasses are to play an important role in sandveld agriculture, but at Grasslands grazing trials continue to yield most encouraging results which make this obstacle to their widespread use well worth solving.

HORTICULTURE

Expansion of the horticultural industry continued as farmers became more diversified in their cropping programmes. Large commercial plantings of deciduous fruit trees were made in the Marandellas, Macheke and Rusape areas, being mostly of the newer varieties of Yellow Cling peaches for canning. Additional fruit trees were planted in the Eastern Districts mainly to augment existing orchards, also more apples were established at Umvukwes. With the exception of apples, Rhodesia is now self-supporting in season with deciduous fruits and has fairly large supplies for export.

The extensive expansion of the Mazoe Citrus Estates was continued with many more orange trees planted. Coffee and tea plantations increased in the Eastern Districts. Vegetable production was well maintained, except in Matabeleland where decreased water supplies reduced plantings.

In horticultural cropping, the country has no major production problems and far greater expansion is possible, the only limitation being that of markets.

Very dry conditions and much reduced rainfalls were common, yet production of horticultural crops was extended, with the greater intensification of irrigation schemes. Although frosts were less severe, May proved to be the second coldest month on record, which had a marked effect on plant growth. Hail occurrences were few; two apple orchards were affected.

Fruit

Deciduous

Fruit crops were good, especially dessert peaches and plums and, with a pleasing continuity of supply.

The younger trees are now giving increased commercial yields and fruit quality is high, due to improved and more modern orchard management. The air export of peaches to Europe continued to be successful and the quantities were increased. Fruit size was reduced where irrigation was limited.

A very successful grape season was enjoyed with much improved quality and increased cropping. It is proving a popular crop with farmers and growers throughout the country and plantings were continued. Quite a quantity of grapes are imported from South Africa each year which can be reduced. Consumption continues to increase. While only very small quantities of wine are made, discussions were held to examine commercial production possibilities by the trade.

Deciduous fruit imports for 1964 totalled £277,745, of which £164,211 was for apples.

Citrus

Cropping was good, with harvesting of oranges being extended over a long season. Lemons became very scarce in mid-summer, the small supply on offer fetched exceedingly high prices.

The popularity and increased demand for naartjies of good size had a marked effect on mid-season oranges and orange sales were slow at the time.

Grapefruit were plentiful, both for canning and fresh fruit for export from the lowveld. The Marsh's Seedless variety does extremely well there. Total exports of oranges, lemons and grapefruit for 1964 were valued at £62,034 being shipped out at Lourenco Marques port for overseas markets.

Fruit juices (citrus) exported were much increased to £230,185 for 1964 from £166,153 in 1963.

Sub-Tropical Fruit

Limited expansion occurred. More success was achieved with the air export of avocados to Covent Garden Market and extra trees of the popular Fuerte variety were planted. More mangoes were grown and exported, plus trial lots of granadillas, which were also exported.

A few acres of Cavendish bananas were planted in the Chiredzi area but some frost damage was experienced. Improved sitings for subsequent plantings will be helpful. Adequate rail communications are now available and there are no marketing problems. Contracts can be arranged. With the low winter temperature, Umtali had to augment their production for local markets with supplies from Mocambique.

Total imports of sub-tropical fruit for 1964 were valued at £82,402.

Tree Populations

	No. of trees	*Declared value of fruit sold* £
Citrus	695,000	340,000
Apple	93,000	25,000
Peach	50,000	19,000
Plum	23,000	5,000
Pear	4,000	1,000
Papaw	7,000	2,000
Mango	11,000	1,000
Avocado	4,000	1,000
Banana	296,000	12,000
Grape	84,000	4,000

An appreciable number of these trees have yet to reach the bearing stage.

Vegetables

Due to the drought in 1964 and some marketing difficulties the previous year, the recorded acreage of vegetables was reduced by 870 to 4,460 acres.

Importation of fresh vegetables, mainly for Bulawayo from South Africa, totalled £33,500. Exports of processed vegetables were in excess of those imported.

Onions

While there was a slight decrease in the 1964 acreage of onions to 280, the crop reaped was almost as great as in 1963, due to a high average yield per acre. Prices improved. Production is now more intensive. Import control from South Africa was extended to include the month of July and operates until the end of January.

Mushrooms

The imposition of 1s. per lb. duty on fresh mushrooms considerably stimulated local production and markets were so well supplied that prices had to be reduced.

Air Exports

Following last year's successful air exports of green beans to London, this was increased, and with chillies, sweet peppers, courgettes, sugar peas and some herbs were also exported.

Special Crops

Coffee

In spite of frost damage, which reduced production, 60 tons of green graded coffee were milled for 15 growers. This represents an increase of 20 per cent. on the previous year's production and of seven in the number of growers.

The grades were most satisfactory with nearly 34 per cent. in AA and 28 per cent. in A.

There has been continued improvement in cultural standards as well as improvements made in farm processing and in milling.

Growers are considering a uniform and controlled system of grading which will be in the interests of all.

A Coffee Production Committee set up to co-ordinate research, extension and production interests met during the year.

The Chipinga Experiment Station, though short of funds, continued its establishment programme and started a number of investigations. The main problems to be investigated are combating frost, shade effects, particularly in relation to the over-bearing problems, irrigation requirements and varieties.

Tea

Tea plantings continue to increase, the acreage now being 6,260 (1963, 5,990). A total of 3,069,100 lb. of tea was produced. Exports were valued at £162,800.

A scheme has been commenced in the Chipinga area for farmers to produce tea in the green state for supply to the factory there. More tea has been put under irrigation on one of the estates.

Essential Oils

With the large quantity of oranges being used for juice extraction, a consequent increase in citrus oils occurred. Exports for 1964 were valued at £36,200.

Further plantings of the rose-scented geranium (Pelargonium graveolens) were established in several areas. Growth was less than expected as the rains were patchy and ended early. One small commercial quantity of oil was exported to France. Prospects appear to be promising.

Cut Flowers

While the production of cut flowers for local markets increased and trade improved, the air export of flowers to Europe was disappointing and at times scarcely profitable. Mostly gladioli and carnations were sent out.

Nursery Trade

Nursery plants and trees were readily produced and trade was extended. Rhodesia is self-supporting in its requirements of citrus trees but still relies on South Africa for most of the deciduous fruit trees.

Pests and Diseases

A build-up of thrip insects occurred in a number of citrus orchards where no spraying had been carried out for some years. Such fruits were badly scarred. Crops of the cabbage family suffered much damage from the cabbage moth caterpillars, which were difficult to control by the normal sprays recommended. Fruit sucking moth attacks were slight.

Mildew diseases were common on late crops of peas, mangoes, grapes, apples and peaches. Tomatoes were much less affected by their respective diseases owing to the drier season. Fruit Fly insects were readily controlled by Lebaycid spraying, which is now universally carried out.

Research and Investigational Work

Within the Branch of Horticulture, research on deciduous and soft fruit is carried out at the Rhodes Inyanga Experiment Station. Some vegetable research, trials and investigation of geranium for oil, plus pyrethrum, are conducted at the Henderson Research Station. Coffee research is centred at the Chipinga Experiment Station, also some vegetable trials. This work is included in the station's own report.

For the second season the pyrethrum flowered well. Trial lots from five varieties were harvested and dried for tests later for pyrethrum content to compare the flowers from two wide ranges of altitude.

A crop of the Roma variety of tomato grown on heavy red soil near Salisbury was much affected by boron deficiency soon after planting out. The plants responded to the trace element treatment.

Naartje and litchi trees suffered from what resembled the delayed availability of zinc during low night temperatures in late spring. Normal growth followed as temperatures increased.

Marketing

With the country in a more stable condition marketing generally improved with demand and prices more favourable for producers. The standard of produce, packing and presentation continued to improve.

Some difficulty was experienced with the marketing of peaches and plums in Salisbury, due partly to the fruit being too ripe and to poor distribution. Means to obviate these troubles the coming season are in hand. The apple crop was insufficient for the country's needs by late March and importation was then permitted. Crops sold well.

Vegetables were in heavy supply in November and December. Tomato growing became too popular and with a longer spell of lower prices some cut-back in production became necessary. It was possible to export some of this produce, which helped to save the situation.

Surveys were carried out in respect of air exportation of produce to estimate freight space requirements for the coming season.

A market agent was permitted to operate on the Salisbury Municipal Produce Market, which is a new departure in Rhodesia. A new independent auction market in Salisbury was also started.

Processing

While some increase in the processing of fruit and vegetables took place, there is still considerable leeway to make up to capture more of the home market. A new canning factory is soon to open at Rusape and the Umtali enterprise has been expanded. In the Salisbury area a few such small factories operate.

With the new plantings of the earlier season varieties of canning peaches a better continuity of supply will follow together with increased production from new areas.

Commercial trial plantings of peas using the much increased seed rate and the inclusion of other processing varieties were successful. Contracts for the supply of fruit and to produce vegetables were readily taken up by growers.

Staff and Services

Except at head office, where the shortage of staff affected operations, the situation otherwise was reasonably satisfactory. Horticultural services were supplied throughout the country and which work was carried out in co-operation with the staff of the Department of Conservation and Extension. Requests for such services continued to increase.

In-service training courses in horticulture were continued and various field and group days were held so that specialist officers could operate more effectively. Support was given to the Natural Resources Board farming course for younger farmers, held at the University College, Salisbury. A two-day Horticultural Conference for the Ministry of Agriculture officers was held at Chipinga. Various horticultural pamphlets were written and articles supplied for a number of publications.

BOTANY

Introduction

The most important event of the past year from an administrative point of view was that the Branch of Botany became a separate organization, with the Government Herbarium and the National Botanic Garden in its charge, in July, 1965. The sections of Plant Pathology and Seed Services became at the same time parts of the newly formed Plant Protection Branch and ceased to have any direct connexion with the Branch of Botany.

Herbarium

The total number of accessions for the year was 7,440, bringing the total number of specimens in the herbarium to more than 165,000. These included determinations for Plant Protection, Grasslands Research Station, Pasture Research, Matopos Research Station, Conservation and Extension, National Parks and Wild Life Management, Veterinary Department (including Tsetse Control), Health Department (including Bilharzia Research), Botany, Zoology and Agriculture Departments of the University College of Rhodesia and Nyasaland, Department of Education, National Museums, Natural Resources Board, Forestry Commission of Rhodesia, the Forestry, Agriculture, Education and Game Departments of Zambia, the International Red Locust Service, Abercorn, the Kafue Basin Survey, the Agriculture and Forestry Departments of Malawi, the Agriculture Departments of Bechuanaland Protectorate and Angola, the Agricultural Research Council and the Botany Department of the University of the Witwatersrand.

It will be seen from the number of organizations, both within and without Rhodesia, who make use of our services that the Herbarium is recognized as being the principal centre of botanical systematic research for the whole of South Central Africa.

Named duplicates have been received from Pretoria, Kew, Lisbon, Nairobi, Melbourne, Angola, etc. Over 5,000 named duplicates have been distributed to the above herbaria and many others. Important collections were made in many parts of Rhodesia, some of the places visited including Melsetter, Bindura, Mangula, Umtali, Chipinga, Gatooma, Inyanga, Sinoia, Umvukwes, Sipolilo and Chirundu. Now that Dr. Wild has published his account of the Vegetation of the Great Dyke in Rhodesia he has turned his attention from plants of the serpentine areas to plants of copper-bearing soils. This is not only of taxonomic but of both ecological and geological interest and may prove eventually to give leads to the use of botanical observations in the recognition of valuable mineral deposits.

With the aid of financial assistance from the Flora Zambesiaca scheme and the Bechuanaland Government, a three-week collecting trip was made by Dr. Wild and Mr. Drummond to the north-western part of Bechuanaland (Ngamiland). This area is botanically almost unexplored. More than 500 plant specimens were collected and will be used in the writing of future volumes of the Flora Zambesiaca.

Mr. S. R. Edwards, a student working over the long university vacation, has named and set in order our moss collections, a group which has received no scientific attention in this country since before 1930. Aloe material has continued to be sent to Dr. G. W. Reynolds at Mbabane to help him complete his new work on the Aloes of Tropical Africa and Madagascar. This work, we understand, has now gone to press and is expected to appear about June, 1966. It will be a complete monograph of all the tropical African and Madagascan Aloes, including those from Rhodesia.

Flora Zambesiaca

The page proofs of Vol. 2, part 2, are just beginning to appear and this part should be published by about the end of 1965. It is also expected that the manuscript of the grass volume being prepared by Dr. E. Launert at the British Museum will begin to go to the printers in April, 1966. Dr. H. Wild has now completed his work on the Helianthoideae section of the Compositae and, as the whole Composite volume will still take some years to complete, this part is to be published separately in Kirkia early in 1966. Mr. Drummond is now at work on the Ixoreae, a section of the Rubiaceae, also for the Flora Zambesiaca. Mr. B. K. Simon has begun work on the genus *Sacciolepis* for a later part of the grass volume. Vol. 3, which will deal with the Leguminosae, is being prepared at Kew, and Vol. 3, part 1, which will include the Mimosoideae and Caesalpinioideae, is expected to be completed by the end of 1966.

Kirkia

Vol. 5, part 1, appeared at the beginning of June and Vol. 5, part 2, has already reached the page proof stage and should be published about the end of the year. More than 70 articles, of which the greater part deal with the botany of Rhodesia and adjacent countries, have now appeared in this journal and it can be said that it has, in the past five years, had the greatest influence on the development and progress of botanical research in Rhodesia.

Grasses

During the period January-October, 1965, 1,156 grasses were identified, and of these approximately two-thirds have been incorporated into the herbarium. The majority of existing grass duplicates from the grass herbarium were distributed to the following institutions: British Museum, Kew, Pretoria, Lisbon, Berlin, Livingstone Museum, Sa da Bandeira, Lourenco Marques and Brussels. In addition, duplicates of specialized groups were sent on request as follows: *Digitaria* to Paris, *Arundinelleae* to Ontario and *Panicum maximum* to the Ivory Coast. Preliminary investigations of the genus *Sacciolepis* have begun for the Flora Zambesiaca and collaboration with Dr. E. Launert, who is preparing the grass volume of this work at the British Museum, is continuing.

Economic Botany

Work on various aspects of economic botany has increased in scope with the appointment of an economic botanist, Mr. M. Dale, in January.

Some of the more important or unusual weeds identified during the year were *Brayulinea densa*, *Euphorbia prostrata*, *Portulaca oleracea*, *Ornithogalum seineri*, *Sinapis hispida*, *Brasenia schreberi*, *Trianthema portulacastrum*, *Cuscuta planiflora*, *Eleusine indica* and *Oxalis latifolia*.

The Economic Botanist has also become heavily involved in a comprehensive and random survey of the vegetation of Rhodesia in collaboration with an American pharmaceutical concern which is examining all Rhodesian material made available to them for the presence of alkaloids in the hope that some of them may eventually become of economic importance in the pharmaceutical field. Several plants have already proved of special interest and investigations into these are continuing, e.g. *Aloe globuligemma* and *Guibourtia conjugata*. It is also planned to carry out at the same time as the alkaloid survey a collecting programme for potential oil seeds. This programme is in its very early stages and is being carried out in collaboration with the Commonwealth Tropical Products Institute. Many smaller-scale requests for plants of pharmaceutical interest are also being dealt with and this line of work should get into full swing during the coming year.

Poisonous Plants

The most important item in this field was the publication of the article by Mr. R. B. Drummond and Dr. D. K. Shone on the Poisonous Plants of Rhodesia in the Rhodesian Agricultural Journal. An unusually large number of copies was produced, with handsome coloured illustrations, and the work has already proved tremendously popular among farmers and other interested persons.

This year has also been marked by the first recording of *Albizia versicolor* as a serious poisonous plant in Rhodesia. Two other species of *Albizia*, *A. anthelmintica* and *A. tanganyicensis*, have also been incriminated as causing cattle deaths. This kind of poisoning has been reported previously from Zambia but not in Rhodesia. During September this year in the northern part of the country from Wankie through to Lomagundi and Mtoko, a large number of deaths occurred due to the eating of unripe pods. Poisoning ceased as soon as the pods became ripe. It is possible that this type of poisoning has occurred previously in cycles of about eight years but, until this recent occurrence, the cause of death had not been identified. Now that the plant causing the trouble is known fairly simple precautions can be taken to prevent serious outbreaks in future. The Research Branch of the Department of Veterinary Services is carrying out work on the chemical aspects of this problem.

Botanic Garden

Development

After three years of active development the garden is reaching the stage when it should begin to prove a definite attraction as far as the public are concerned. In the northern part of the garden along Sandringham Drive a start has been made with the first exotic section, which covers south and central America. One hundred trees and shrubs were planted at the beginning of the year and some species have already flowered. By next year we should have quite a colourful display. We are concentrating on this section because of the ecological similarity of parts of central and south America to this part of Africa and we are continuously receiving new supplies of seed of rare species from this area. It will be expanded rapidly in the next few years. Our indigenous section has now had approximately 430 trees planted out in it and a few specimens, particularly in the forest area, have reached heights of over 12 ft. Labelling of the specimens has begun and this should also increase public interest. Two systematic sections, one devoted to the genus *Acacia* and the other to the family Combretaceae, have also been commenced. These should prove particularly valuable in the teaching of ecologists and field workers to recognize members of these difficult genera. Work has also begun on a poisonous plant garden and a garden of economic plants. Specimens of coffee, tea and tung have already been planted out.

The construction of the new approach road to the herbarium and parking area has been completed, as has also the construction of the entrance opposite the top of Downie Avenue. Tenders are now being put out for the wrought iron gate, which will complete this particular project.

During the year a great effort has been made with the breaking and digging out of stones obstructing mechanical grass cutting. As a result, the desired effect of clearly defined rocky outcrops surrounded by mowable grassy areas has been achieved in a further 35 acres. Many uneven areas have been dug up and levelled and about 12 acres have been planted with indigenous *Cynodon dactylon*. A start has been made with the improvement of the internal roads and so far 250 yards of foundation have been laid. The reticulation system extension along Sandringham Drive has been completed and connected to the municipal water supply; 1,500 ft. of piping were laid and six hydrants installed. The prison has supplied an average of 15 convicts per day during the year.

Index Seminum

The 1965 Index Seminum has been sent out to more than 200 botanic gardens abroad. The list includes 240 species, and many orders from it have been received. Seed has been received in continuation of exchange from Angola, Argentine, Brazil, Chile, China, Hong Kong, India, Ivory Coast, Nigeria, Peru, Senegal, South Africa, Uganda, U.S.A. and Venezuela, as well as from different parts of Rhodesia.

Nursery

Over 700 species, mainly trees and shrubs, have been sown, many of them being interesting new introductions. Approximately 2,800 plants have been potted up; a substantial portion of them will be ready for planting out during the coming rainy season.

PLANT PROTECTION

Entomology

Outbreaks and Records

An outbreak of the African Migratory Locust was discovered at the Hippo Valley Sugar Estates, Chiredzi, infesting several thousand acres of sugar-cane during January, 1965. The outbreak was controlled by aerial sprays with dieldrin or carbaryl, but surveys have been necessary since in order to check for possible breeding areas. During an aerial survey, made possible by the assistance of the International Red Locust Control Service, several breeding populations of both the African migratory and the red locust were located in the veld and a considerable outbreak of the migratory locust was discovered in the Triangle Sugar Estates. The latter was controlled with insecticides. It is evident that the situation will need careful watching.

Peak flights of army-worm moths detected in the light trap maintained at Salisbury led to warnings being issued in January on the possibility of army-worm outbreaks in crops. The outbreaks developed as anticipated, but fortunately only in the vicinity of Salisbury and Gwelo.

Other pests of increased importance were soil pests of maize, including snout beetles, *S. exaptus* and *M. dentipes*, and surface beetles, *Herpiscius somneri* and *Gonocephalum simplex*; the maize caterpillar, *Acantholeucania loreyi*, caused unusual widespread damage to silks of maize cobs; and termites severely damaged summer wheat grown in the Hunters Road area. Special mention must also be made of extensive damage being caused by harvester termites to the veld in much of the lower rainfall areas of Rhodesia and the urgent need for their control.

Research

Maize snout beetles, S. exaptus and M. dentipes

Investigations into the behaviour and control of these troublesome soil pests were continued.

It was shown on a farm scale that grubs of *S. exaptus* could be virtually eradicated by application of D.D.T. timed to kill adults before eggs were laid in the previous season.

M. dentipes were not so readily controlled by this method as adults shelter under clods of soil during the day.

Further critical trials were made at Gwebi College to screen insecticides for application into the soil to control larvae. Improved protection of young maize seedlings was obtained with a new insecticide, G.S. 13005 or Supracide.

A critical trial was also made to compare the effect of different crops and plant populations on numbers of *S. exaptus* grubs in the soil the following season. Significant differences in numbers were obtained and these confirmed that crops of soya beans, low or high populations, and sunnhemp increase larval numbers and that velvet beans decrease populations.

Surface Beetles

Laboratory essays and field trials were carried out to establish the best measures for control of the surface beetles, *Herpiscius somneri*, *Gonocephalum simplex*, *Emyon tristis* and *Zophosis sp.* These demonstrated that very good control of all beetles, excepting *Zophosis*, was obtained by broadcasting baits of dieldrin in mealie meal. Baits including BHC or D.D.T. were not as good and poor control was obtained by direct applications of insecticides.

Trash on lands was shown to encourage surface beetles.

Potato Tuber Moth and Potato Aphis

Results of replicated insecticide trials at Henderson Research Station showed Azinphos-methyl (Gusathion) to be the best insecticide available at present for control of tuber moth larvae mining in leaves and

stems of potatoes. Carbaryl was the best safer alternative. Dimethoate gave very good control of potato aphis and was superior to malathion. The use of menazon tuber dip or phorate granular at planting was found to depress yields and have no advantages over dimethoate for aphis control.

Laboratory bioassay techniques developed last year were used to screen various insecticides by probit analysis. The results for D.D.T. indicate that strains tested have a tolerance for D.D.T. of the same order as that for resistant strains which have been found in Australia.

Hilda patruelis

In an insecticide trial at Henderson Research Station it was shown that *Hilda patruelis* infestation can be prevented by eliminating associated black ants with dieldrin applied into the soil before planting.

Termites and Cutworms

Insect damage to pods of groundnuts was thoroughly examined as part of the country-wide survey in connexion with the Aflatoxin research programme. Preliminary results from 105 sites show that more than 10 per cent. of all pods were damaged by insects. Most of this damage was caused by cutworms or termites. The incidence of both types of damage varied greatly, but unexpectedly cutworms were quite as important as termites. Correlations between numbers of damaged pods and aflatoxin levels are suspected but have not yet been computed.

An interesting and important result was obtained from groundnut drying trials carried out at eight research stations. At each site half the plot was treated with dieldrin applied into the soil before planting. This measure gave full protection to nuts from termites but seemed to encourage cutworm attack on treated parts of plots on several research stations. This may have been due to control of black ants which are predators of cutworms.

Woolly Aphis

Results of replicated insecticide trials in the Eastern Districts indicate that good control of root infestation to apple trees by woolly aphis may be obtained by soil applications of vamidothion or dimethoate emulsifiable concentrates in water. Control was obtained for five months after application.

Coffee leaf miner

Eleven insecticides were compared in a field trial for control of coffee leaf miner *Leucoptera coffeella*. It was found that best results were obtained with parathion, sumithion, lebaycid and diazinon in that order.

Chafer larvae, Eulepida mashona

Eleven insecticides were compared for control of full-grown chafer larvae damaging young pines at Stapleford Forest Research Station. Dieldrin, thiodan, thimet and lebaycid gave best control and emulsifiable concentrates were more effective than wettable powder formulations.

Leaf miner, Liriomyza brassicae and aphids, Brevicoryne brassicae on Cauliflowers

A comparison of six organo-phosphorus systemic insecticides indicated that best control of aphis and leaf miner was obtained with dimethoate.

Scale Insects

Compilation of a check list of Rhodesian scale insects is continuing and six new species were discovered during the year.

Stored Products Research

An entomologist is seconded to the Grain Marketing Board for investigations under the immediate direction of their Chief Pest Control Officer. The possibility of controlling the moth *Cadra cautella* by encouraging the activity of natural parasites is being studied. Life cycles of the moth and the parasite *Bracon hebetor* have been worked out under controlled conditions and biological control trials have been carried out on small experimental stacks. These are to be extended this year.

NEMATOLOGY

The Senior Nematologist returned in January from an F.A.O. Fellowship to the U.S.A. Subsequently his work covered routine examinations of commercial nurseries for harmful nematodes, answering approximately 100 advisory enquiries as well as investigational work.

Heterodera cacti was discovered infecting a potted cactus plant. This is the first record of a naturally occurring infection of the genus *Heterodera* in Central Africa and is believed to be a new species record for the continent.

Heavy field infections of *Meloidogyne hapla* on roses have been detected at three localities.

Investigations

Hot Water Treatment

Potato tubers, corms of gladioli and cyclamen and the roots of rose bushes have all been subjected to treatments at a range of temperatures and exposure periods. Results indicate that nematode control can be achieved without plant injury resulting, in all cases except that of cyclamen. This work promises to be of value to potato breeders and plant exporters.

Nematicidal fumigants

Fumigation trials have been initiated for peaches, sugar-cane, tobacco, maize, cotton, peanuts, love grass and Katambora Rhodes grass, using ethylene dibromide, dichloropropene, dibromochloropropane and a mixture of ortho- and para-dichlorobenzenes. The peach trials are on trees infected with *M. javanica*, growing in sandveld, and fairly typical of the areas being planted to supply fruit for the proposed canning factory at Rusape.

The ortho-paradichlorobenzene mixture is a by-product from Klipfontein Organic Products, the use of which on a small plot at Chirundu treated two years ago has led to greatly increased yields of sugar-cane. Application in the current experiments, was by means of a logarithmic machine, dosages ranging between 60 and 10 gallons acre being used. In addition to sugar-cane, both tobacco and maize will be planted in treated areas.

Dibromochloropropane has also been applied logarithmically to ascertain the dosage rate which, without phytotoxicity, will economically control nematodes affecting tobacco and maize. Trials using dichloropropene have been started in soils heavily infested with *M. incognita* var. *acrita*, to ascertain the effect of this nematode on cotton, peanuts, weeping love grass, maize and Katambora Rhodes grass. *M. incognita* var. *acrita*, although recorded in Rhodesia for a number of years, was for the first time found this year seriously affecting cotton.

There is a certain amount of evidence indicating that although cotton is a poor host to *M. javanica* and reduces this pest when used in tobacco rotations, it itself adversely affects nematodes which enter its roots. Fumigation trials using ethylene dibromide have been initiated to help evaluate the situation.

Plant Imports

Among the large number of peach trees imported this year from the Republic of South Africa, some have been found to be heavily infected with *M. arenaria*.

Plant Pathology

Outbreaks and Records

The number of disease specimens submitted to the laboratory for identification amounted to 621 and these included the following new records of interest.

Needle blight of *Pinus radiata* due to *Cercospora pini-densiflora*, Sclerotinia rot of lettuce due to *Sclerotinia sclerotiorum*, warty disease of coffee due to *Botrytis cinerea*, white rust of cauliflower due to *Albugo candida* (new host record). New diseases recorded on sugar-cane included red rot (*Physalospora tucumanensis*), basal stem and root rot (*Marasmius sacchari*), rust (*Puccinia erianthi*) and leaf scald (*Xanthomonas albilineans*).

Tobacco

Tobacco veinal necrosis virus (necrotic strain of potato virus Y) was identified on only one crop following careful checks by members of both this Branch and the Tobacco Extension Service. The outbreak was on a crop of Burley tobacco at Mount Hampden which showed 2 per cent. infection of necrotic Y. Symptoms of the common non-lethal strain of Y virus appeared in many Burley lands even when apparently well isolated from potato crops. There exists the possibility, however, that in such cases the diseases may have been contracted in the seed beds, which are so very often located in proximity to such sources of infection as farm vegetable gardens.

Potatoes

Tobacco veinal necrosis virus was identified for the first time on potatoes. Crops of variety Trianta (Loman) at Enterprise and on the Salisbury Research Station, both grown from the same imported consignment, carried this disease, which in the case of this variety produced the typical leaf drop streak symptom. The more commonly grown variety, Up-to-Date, failed to show any symptoms after repeated inoculation with this virus disease.

Late blight epidemics were widespread in the summer rainfall crops but were less severe than usual, except at the higher altitudes in the Eastern Districts where severe losses in yield occurred in some late planted crops.

A high incidence of leaf roll virus in some crops grown at the lower altitudes resulted in their rejection from certification.

Tomatoes

For the second season running there were no reports of late blight on this host, even though nearby potato crops in many instances were infected. Bacterial canker again appeared in many areas and early blight and mildew (*Leveillula taurica*) caused serious losses during the early summer period. Poor colouring, with vein browning in the wall of the fruit, resulted in considerable wastage, particularly during the rainy season and was more prevalent in crops of high yield potential. This abnormality occurred mostly on the lower trusses and appeared to be associated with excessive shading of the fruit combined with prolonged overcast conditions.

Legume Crops

During the intensely wet period of December and January a number of velvet bean crops became infected with root and vine rot (*Phytophthora dreschleri*). Other disease outbreaks of importance included bacterial blight of beans and Mycosphaerella blight of peas, mostly on crops grown with overhead irrigation.

Citrus

One further outbreak of citrus black spot was discovered, this time at Gwaai (Victoria Falls Road), bringing the total number of known outbreaks in commercial orchards to four. Symptoms again appeared in the infected groves at Gwelo, Odzi and Old Umtali, but the disease has continued to remain extremely localized and in most cases is confined to the same individual or groups of trees which showed symptoms in previous years.

Sorghum

Severe attacks of downy mildew (*Sclerospora sorghi*) occurred in most crops planted in the Midlands and Matabeleland, but very little infection occurred in the higher rainfall areas of Mashonaland. Framida appeared to be less susceptible to this disease than the other varieties at present grown commercially.

Wheat

In summer crops, stem rust appeared later than usual and caused little damage except on highly susceptible varieties. Leaf rust, on the other hand, caused considerable leaf damage, but little is known at present about the effects of this disease on grain yield.

Winter crops, for the most part, were either free from rust or attacked too late for yields to be seriously reduced. A notable exception was the variety Mazoe, which, although escaping infection in most areas, became severely infected at Old Umtali and to a lesser extent in some of the other warmer areas.

Several winter crops were attacked by powdery mildew and it is suspected that heavier application of nitrogen, without a corresponding increase in phosphate and potash application to provide a balanced nutrition, may have increased susceptibility to this disease.

Sugar-cane

The most outstanding discovery of the year was the identification of leaf scald (*Xanthomonas albilineans*) in several plantations in the south-eastern lowveld area. The acute phase of this disease, causing death of stems, was recorded on N 50/211 (Salvo), CP 44/101, B 49119, NCo 310 and NCo 376. Mild symptoms appeared on CP 44/155, Co 779, Co 1001, B 45151, B 34104 and M 112/34. Circumstantial evidence suggests that this insidious disease may have been present in local plantings for many years. Trials are being undertaken to test the relative susceptibility of promising new varieties before release for commercial planting.

Coffee

An unusual symptom appeared on the berries in several plantations during the winter months. The skin of the green berries first developed a russetted appearance and later turned black, but the actual cause is unknown. Although these symptoms followed periods of unusually cold weather it seemed unlikely that the low temperatures were directly responsible, because these symptoms also appeared on berries well protected by a dense canopy of foliage which in itself showed no signs of cold injury. Fruiting bodies of *Glomerella cingulata* developed in most cases on the blackened areas of the berries after a few days incubation, but the role this fungus played, if any, in producing the disease requires further investigation.

Research

Wheat

Summer crop collections of stem rust were identified as in the previous year as races 21 and SR 1, the latter not matching any of the races described in the international register of races. Collections from winter crops are still being subjected to race analysis. In view of the breakdown of Mazoe it appears likely that a new race or biotype of the stem rust fungus has recently developed in this country.

Studies on the mode of inheritance of resistance to local stem rust races were continued and the back crossing programme designed to incorporate increased resistance to stem rust in commercial varieties has been expanded considerably.

Potatoes

Surveys carried out on A grade certified seed potato crops in the Eastern Districts showed that the amount of detectable virus in these stocks has remained extremely low and there was no evidence of any significant spread of aphis-borne virus diseases. Traces of leaf roll and potato Y virus (common strain) were found in only a few crops. In the case of severe mosaic it was evident that the infection had been introduced in the original seed stock and had been perpetuated by the planting of the occasional diseased tuber. Two different strains of potato X virus were identified by cross inoculation to tobacco as being responsible for the occasional severe mosaic symptoms. Most stocks of Up-to-Date carried a high incidence of the mild strain of virus X but without producing symptoms on this variety.

Groundnuts

In studies on aflatoxin contamination of groundnut kernels it was found that invasion by *Aspergillus flavus* and other mould fungi occurs only through punctured shells. The chief causes of shell damage in growing crops were considered to be due to insect damage and physiological splitting resulting from fluctuating water supply. Pods which were broken during lifting could still be invaded by *A. flavus* during the curing period.

In a spray trial to determine the effects of defoliation due to *Cercospora arachidicola* on kernel yield, M-45 and wettable sulphur were equally effective in controlling the leaf spot. Although spraying reduced defoliation in the early maturing varieties, Valencia and Natal Common, at the time of harvesting from 78 per cent. to 38 per cent., the increases in kernel yield, amounting to only 7 per cent., did not reach significance. With the late variety, Makulu Red, although the defoliation was reduced from 46 per cent. to 19 per cent., leaf spot control actually resulted in a 26 per cent. reduction in kernel yield. With very little rain falling after the beginning of February the crop suffered severely from drought and this probably affected the late maturing variety to a greater extent than the early varieties. Under these conditions it would appear that defoliation may have been of some benefit to the developing kernels by reducing foliar transpiration, thus nullifying any benefits to be gained from leaf spot control.

SEEDS

Laboratory

Despite the shortage of trained staff during the year, there was a 19 per cent. increase in the number of samples received for testing compared with the previous season (Table 1). Altogether 4,278 tests were made for purity and germination, disease, identification and weed seed counts, and for compliance with the regulations of foreign countries. The number of International Orange Certificates (60) and phytosanitary certificates (324) and certificates of wholesomeness for groundnuts (26), show that the current expansion of the export seed trade has been well maintained.

TABLE 1

Category	Number received, 1963–64	Number received, 1964–65	Increase or decrease per cent.	Number of samples below prescribed minimum, 1964–65		Total percentage below prescribed minimum, 1964–65
				Purity	Germination	P. and G.
Maize	340	418	+ 23	—	16	3·8
Other cereals	98	188	92	5	15	10·6
Legumes	579	565	− 2	4	42	8·1
Grasses	215	280	+ 30	—	5	1·8
Vegetables	545	712	+ 31	8	70	11·0
Tobacco	304	302	—	—	27	8·9
Miscellaneous crops	88	140	+ 59	—	1	1·0
Flowers	104	77	− 26	N/A	N/A	—
Weeds	—	32	+ 100	N/A	N/A	—
Identification	24	17	− 3	N/A	N/A	—
TOTAL	2,297	2,731	+ 19	17	176	7·1

Other Tests

Seed Identification.—The number of specimens of seed submitted for identification declined from 24 to 17.

Aflatoxin.—1,046 groundnut samples were examined for purity and these results were reported to the Aflatoxin Committee.

Weed germination tests.—21 different weeds were received for germination and various tests were applied to obtain optimum results. These tests are being carried out for various research stations currently investigating crop protection problems.

Investigations

Seed Storage.—Some deterioration occurred in seed of different cops stored for various periods (Table 2). Seed was tested every three months.

TABLE 2.—KIND OF SEED

Age of seed in months	Sunn-hemp	Dolichos bean	Castor bean	Paspalum	Maize	Ground-nut	Soya bean		Carrot	Lettuce		Parsnip snip
							L337	L340		V97	V117	
0	53·0	38·8	41·0	45·5	98·0	98·5	96·0	96·5	88·3	98·0	98·5	34·5
6	—	—	85·5	75·5	98·0	—	98·0	92·5	91·7	97·0	94·5	—
9	88·0	—	—	—	98·5	92·5	95·5	88·0	87·0	98·5	97·0	—
12	—	90·0	—	—	97·0	—	97·0	91·0	84·3	95·0	77·5	7·8
18	95·5	94·0	—	—	98·0	—	94·5	85·5	85·8	96·0	63·0	—
24	—	—	—	—	97·0	—	95·0	83·5	84·3	92·5	46·0	—
36	—	—	—	—	—	—	—	53·5	69·1	88·0	Nil	—
48	—	—	—	—	—	—	—	—	67·0	—	—	—
108	83·0	—	—	—	—	—	—	—	—	—	—	—

Columns 1, 2, 3: Crops with hard seed. Column 4: Effect of age on dormancy.

Drill Box Seed Survey.—97 samples were submitted by Conex from various sources to check the germination of seed planted for the 1964–65 season. The results of this survey are shown in Table 3.

TABLE 3

Kind	No. of samples submitted	No. of samples below prescribed minimum germination
Maize	20	10
Legumes	26	—
Sorghums	45	11
Tobacco	1	1
Grasses	1	—
Sunflower	1	1
Cotton	1	—
Vegetables	2	—
TOTAL	97	23

Seed Legislation

The Seed Inspector paid 109 visits to various seed wholesalers and retailers and sampled 16,547 lb. and 1,037 packets in pursuance of his duries under the Seeds Act. In addition, 239 visits were made to sample over 2,418,214 lb. of seed for the various certification schemes and seedhouses engaged in the export seed trade (Table 4).

TABLE 4.—WEIGHT OF SEED SAMPLED

	Horticultural and crop seeds	Pasture seed	Seed potatoes	Tobacco seed	Seed legislation
Passed	470,648 lb.	145,425 lb.	20,150 pockets	106,896 ozs.	16,160 lb.
Rejected	13,800 lb.	2,189 lb.	1,660 pockets	3,264 ozs.	337 lb.
Passed	—	—	—	—	492 packets
Rejected	—	—	—	—	342 packets

Seed Production

The total acreage established to seed crops for certification or export purposes during the year was 6,216 acres (Table 5), a slight drop compared with the previous year (6,383 acres). The number of visits to inspect these crops rose from 591 to 621 during the past year.

TABLE 5.—ACREAGE OF VARIOUS SEED CROPS FIELD INSPECTED

Horticultural and crop seeds		Pasture seed		Seed potatoes		Tobacco seed	
Beans	2,103	Katambora Rhodes	1,080	U.T.D. "A" Grade	438	Hicks	7
Lettuce	87	Giant Rhodes	130	U.T.D. "B" Grade	300	Kutsaga	6
Tomato	18	Sabi Panicum	239	Walanga "A" Grade	90	White Gold	1
Flowers	34	Weeping Lovegrass	228	Walanga "B" Grade	12	Burley 21	1
Peas	70	Kazungula Setaria	10	Pimpernel "A" Grade	6	Samsun	2
Soybeans	287	Paspalum plicatulum	3	Irene "A" Grade	4	Soluk	2
Groundnuts	295	P. guenoarum	6				
Sorghums	252	Desmodium discolor	32				
Sunflower	28	D. intortum	14				
Wheat	93						
Velvet Bean	77						
Broad Bean	1						
Jack Bean	2						
Cotton	258						
TOTAL	3,605		1,742		850		19

Horticultural and Crop Seeds.—The pattern of production followed that of previous years in that the main export crops, beans (2,103 acres), lettuce (87 acres), peas (70 acres) and tomatoes (25 acres), were mainly grown in the low- and middle-veld.

Sorghum seed production was largely confined to Matabeleland. The grain varieties grown seemed to have satisfied local demand but a large shortfall of the present market's requirements has been experienced with the silage types.

The new cotton seed certification has now reached its second multiplication year and a corresponding increase in acreage was inspected.

Wheat seed production has remained at a low ebb, only 93 acres were submitted for inspection, of which 70 acres were established to the Mazoe and Marodzi varieties.

Pasture Seed.—Though the acreage inspected showed a decrease of 8 per cent., more varieties were submitted for certification than in previous years. Further progress has been made with the multiplication of the two new releases from Grasslands Research Station, viz: *Paspalum plicatulum* and *P. guenoarum*. A start has also been made with *Paspalum notatum*, a new release from the same station. Of the two perennial legumes, adequate supplies of *Desmodium discolor* are now available but no seed was produced from *Desmodium intortum* which still appears reluctant to flower and set seed in the current areas of production.

Seed Potatoes.—The acreage of A and B grade seed potatoes inspected increased from 561 acres to 850 acres. The main varieties grown for certification were Up-to-Date and Walanga.

Eight per cent. (67 acres) of the total acreage inspected were rejected, the main cause being due to leaf roll. A further 2,316 pockets, or 9 per cent., failed to gain certification at the tuber inspection. Excessive wet rots and tuber moth damage were the reasons for these rejections.

Tobacco Seed.—24 growers registered 19 acres for certification, of which one was rejected for anthracnose, and another for the presence of off-types at the flowering inspection. A thorough revision of the rules was carried out by the Technical Committee and these will be enforced during the coming season.

Plant Quarantine

Imports

A general decrease is noted from all stations, with an overall decrease of 1,134 consignments and 151,863 packages on the same period last year. This is probably due to the increased supply of local produce.

Special Permits

Four hundred and sixty nine permits were issued for the importation of seeds, plants, and bulbs into Rhodesia.

Phytosanitary Certificates

Four hundred and fifty two phytosanitary certificates were issued, mainly for exports of tobacco and groundnuts, and, in the case of Umtali station, of vegetables to Moçambique.

Citrus Imports

A general decrease in imports from Moçambique is evident, and it is noticeable that naartjies comprised the bulk of imports, all were covered by permit, and fumigation certificates.

Deciduous Fruit

Imports from the Republic of South Africa were examined on entry and found to be of good standard, and no Codling Moth infestations were detected.

Local fruit, exported by members of the Rhodesian Deciduous Fruit Growers' Association, was also inspected. A general improvement was noted in the quality and packing.

Dahlia Tuber Imports

A total of 2,900 tubers were intercepted and checked against import permits. Prohibited tubers from the Republic of South Africa were either returned at consignees expense or destroyed.

Destructions

There were 48 destructions from all stations. These concerned prohibited imports and those imports not covered by permits.

Fumigations

A total of 48 fumigations were carried out, of which 40 took place in Salisbury, mainly of tobacco samples.

Nursery Inspections

All registered nurseries were inspected at least once, and registered Dahlia growers were also inspected and no Kromnek disease detected.

General Review

The volume and nature of the analytical and advisory service provided to the public has been much the same as last year. The numbers of soil samples from Rhodesian farmers increased by 6 per cent., maintaining the usual annual rate of expansion, but this was exactly counterbalanced by a 78 per cent. decrease in samples from Zambia, whose Government has instituted its own soil-testing service. Analysis of other materials for private individuals and non-Government organizations increased considerably, but this was largely accounted for by aflatoxin determinations for the Grain Marketing Board in connexion with their control measures to ensure that the quality of groundnuts released for human consumption conforms to the standard set by the Ministry.

It is gratifying to note that for the first time in ten years no significant backlog of soil samples awaiting analysis developed at the peak of the season, owing partly to the provision of an additional analyst and partly to a more even distribution in the receipt of samples. It is hoped that this position will be maintained, thus removing a legitimate cause for complaint by farmers.

The number of samples analysed for research stations increased by 9 per cent. in the case of soils, but decreased appreciably in the case of plant and animal materials. More of the straightforward work in the latter category was handled by analysts seconded to the major research stations, leaving the Salisbury laboratory freer to deal with the ever-increasing demand for the more complex and time-consuming analyses of bloods and sera from animal nutrition experiments.

In September the spectrographic laboratory, which has been closed for two years, was re-opened after a chemist had attended a short post-graduate course in spectroscopy at the University College. As soon as essential preliminary work has been completed, it will again be possible to undertake diagnostic work on nutritional disorders of growing crops and to continue minor-element investigations.

On the pedological side, soil surveys covered approximately one million acres. Once again most of the work was undertaken for the Ministry of Water Development to establish the soil potential of major irrigation projects, mainly in the south-eastern lowveld. Slightly more than half the commandable land examined on such schemes has been classified as suitable for irrigation, which is a relatively high proportion.

The Senior Soil Scientist completed the work of many years on a comprehensive scientific description, classification, and mapping of the soils of Rhodesia. Arrangements have been made for this work to be published in the near future.

The Soil Physicist returned from secondment to the Sabi Valley in January and restarted a research programme that has, of necessity, been in abeyance for nearly two years. He has undertaken a survey of the rooting depth of crops on different soil types by measuring the pattern of moisture withdrawal and has continued studies of the effect of different crops on seasonal moisture deficit. Soil-physics work has also continued on the Sabi Valley and Chisumbanje Experiment Stations.

The Aflatoxin Research Team set up by the Ministry in October, 1964, comprising members of the Plant Protection Branch, the Salisbury Research Station, and the Department of Conservation and Extension, under the leadership of an agricultural chemist, has carried out three major projects and several minor ones in an attempt to establish the incidence and level of aflatoxin contamination of the Rhodesian groundnut crop and more especially how and when infection by the causative fungus, and subsequent accumulation of aflatoxin, principally occurs. This is an essential preliminary to devising, if possible, practical control measures. Data comprising entomological, mycological, and climatological observations, and the results of over 2,500 chemical analyses have been amassed and are being coded for computer sorting. Preliminary indications are that valuable information will be obtained. The work will be continued on a modified basis in the coming growing season.

General Analytical Chemistry

Measured in terms of samples analysed, there has been a 20 per cent. decrease in the output of the General Analytical Laboratory. However, numbers alone are not a true reflection of the work of the laboratory, because there has also been a shift in emphasis to types of analysis that involve considerably more work per sample.

The changing nature of the laboratory work can be clearly seen in Tables 1 and 2, which show, respectively, the nature and origin of samples analysed with figures for the previous year in parenthesis.

Farm-feeds and vegetable products, and feeds and faeces from feeding trials, have declined sharply, mainly because more of this type of work has been done by the analysts seconded to the major stations. On the other hand, animal products, and more especially blood and serum samples, have almost doubled, reflecting a trend that has been apparent for several years. Not only have the numbers of such samples

increased, but the range of constituents determined has been widened to include not only inorganic phosphorus, as in the past, but also calcium, magnesium, sodium, potassium, and copper.

The volume of work from private individuals, for which fees are charged, has risen, but aflatoxin analyses of groundnuts submitted by the Grain Marketing Board have accounted for a large part of this.

Work on official samples taken in terms of the Fertilizers, Farm Feeds, Seeds and Remedies Act [*Chapter 186*] has continued at approximately the same level as in the previous year. No action has had to be taken over contraventions of the Act.

In addition to the work summarized in the tables, analysts seconded to the three major research stations have undertaken a considerable volume of routine work, but when these posts have been vacant the work has reverted to the Salisbury laboratory. At Henderson Research Station, where analytical work has been uninterrupted, 976 samples—mainly from complex animal nutrition studies—have been analysed. At Matopos, 2,470 analyses were completed, though the post was vacant from July, and at Grasslands 600 samples were analysed in the five months the laboratory was operative.

TABLE 1.—SAMPLES ANALYSED (OTHER THAN SOILS) 1964–65
(figures for 1963–64 in parenthesis)

Fertilizers and liming materials			57	(97)
Inorganic fertilizers	11	(14)		
Organic fertilizers	8	(55)		
Liming materials	38	(21)		
Other fertilizers	0	(7)		
Farm-feeds and vegetable products			1016	(1785)
Cereal grains	152	(435)		
Leguminous plants	243	(234)		
Tobacco	2	(0)		
Grasses and hays	388	(772)		
Silages	15	(17)		
Farm-feeds	128	(92)		
Other vegetable products	88	(235)		
Animal Products			1246	(711)
Blood and serum samples	1212	(642)		
Other animal products	34	(69)		
Water Samples			214	(117)
Oils and oil-seed samples			280	(609)
Protection products			20	(34)
Arsenical dips	8	(22)		
Organic dips	0	(11)		
Other protection products	12	(1)		
Toxicological specimens			583	(638)
Feed and Faeces from feeding trials			65	(329)
Check samples from research stations			63	(195)
Samples taken in terms of the Act*			121	(110)
Fertilizer samples	43	(73)		
Farm-feed samples	78	(37)		
Miscellaneous samples			53	(3)
GRAND TOTAL			3718	(4628)

*Fertilizers, Farm Feeds, Seeds and Remedies Act [*Chapter* 186]

TABLE 2.—ORIGIN OF SAMPLES ANALYZED (OTHER THAN SOILS)

From the Branch of Chemistry and Soil Science	174	(117)		
From research stations	2153	(2940)		
From other branches of D.R. & S.S.	22	(53)		
From Veterinary Department	735	(1040)		
From Department of Conservation and Extension	189	(216)		
From other departments of the Ministry of Agriculture	9	(30)		
From the Ministry of Agriculture			3282	(4396)
From other Ministries			46	(85)
From private individuals and companies			390	(147)
GRAND TOTAL			3718	(4628)

Soil Testing

Although the number of advisory reports issued increased by 21 per cent. to 1,431, these involved the analysis of almost the same number of samples as in the previous year—4,664 as against 4,668. Reports were issued also on 1,524 samples submitted for compilation of scientific data or correlation with the results of critical field experiments, an increase of 9 per cent.

Table 3 shows the range of crops for which fertilizer recommendations based on soil analysis were given, and also the extent to which Government departments, institutions, and other countries use the service.

Table 4 represents comparative data, and it therefore includes figures from the previous year. It is interesting to note that the number of samples received from Rhodesian farmers has increased by 6 per cent. while those from Zambian farmers have decreased by 78 per cent.

Unlike last year, the backlog of samples awaiting analysis has been kept to a record low level. At no time during the year did the backlog rise above the equivalent of about two weeks' output of the laboratory. This great improvement in what hitherto has been a source of complaint by the farming community is due to the employment of an additional analyst, enabling the output of the laboratory to be increased by one-third, and to a more even distribution in the receipt of advisory samples, owing to earlier sampling by farmers as a result of the early cessation of the rains.

TABLE 3.—SOIL SAMPLES UPON WHICH REPORTS WERE ISSUED

	Rhodesia	*Zambia*	*Other countries*	*Total*
Advisory				
Tobacco: Flue-cured	930	10	—	940
Oriental	35	—	—	35
Burley	76	2	—	78
Seedbeds	28	—	—	28
Maize	1,228	33	4	1,265
Cotton	196	—	—	196
Wheat	28	—	—	28
Potatoes	32	8	—	40
Other cash crops	111	—	4	115
Green manure crops	13	—	—	13
Lucerne and fodder crops	66	—	—	66
Pastures	63	—	—	63
Market garden crops	65	—	4	69
Fruit trees, vines, etc.	78	2	—	80
Sugar-cane	231	1	9	241
Tea and coffee	29	—	—	29
Other specialized crops	10	—	—	10
African farmers' crops	89	2	—	91
Private gardens	162	2	—	164
Sports clubs	65	—	—	65
Diagnosis and fertility assessment	133	—	16	149
pH tests and liming rates	116	—	—	116
Conservation and Extension—				
Field trials and demonstrations in European and African Purchase areas	151	—	—	151
Test demonstration plots in Tribal Trust areas	632	—	—	632
TOTALS	4,567	60	37	4,664
*Investigatory**				
Chemistry: Research	273	—	—	273
Chemistry: Soil Survey	194	—	—	194
Research and Specialist Services	520	—	—	520
Conservation and Extension	54	—	—	54
Other Government departments	26	—	—	26
Statutory bodies	29	—	—	29
Other scientific organizations	428	—	—	428
TOTALS	1,524	—	—	1,524
GRAND TOTALS	6,091	60	37	6,188

*Includes only analyses for compilation of scientific data or for purposes of correlations with experimental data or field observations.

TABLE 4.—ADVISORY SOIL SAMPLES: COMPARATIVE DATA

The table shows, according to countries and categories of work:

(*a*) The number of soil samples on which advisory reports were issued.

(*b*) This number as a percentage of the country total.

(*c*) This number as a percentage of the grand total from all sources.

	Year under review 1964–65			Previous year 1963–64		
	(*a*)	(*b*)	(*c*)	(*a*)	(*b*)	(*c*)
Rhodesia:						
Flue-cured tobacco	930	20%	—	872	20%	—
Maize	1,228	27%	—	1,207	28%	—
Other crops	1,061	23%	—	757	17%	—
Department of Conservation and Extension:						
(*a*) Field trials and demonstrations in European and African Purchase areas	151	3%	—	151	4%	—
(*b*) Test demonstration plots in Tribal Trust areas	632	14%	—	599	14%	—
African Farmers' crops	89	2%	—	123	3%	—
Miscellaneous*	476	11%	—	617	14%	—
TOTAL	4,567	—	98%	4,326	—	93%
Zambia:						
Flue-cured tobacco	10	17%	—	88	32%	—
Maize	33	55%	—	129	48%	—
Other crops	15	25%	—	34	13%	—
Miscellaneous*	2	3%	—	19	7%	—
TOTAL	60	—	1%	270	—	6%
Other countries:						
Flue-cured tobacco	Nil	—	—	1	1%	—
Maize	4	11%	—	2	3%	—
Other crops	17	46%	—	3	4%	—
Miscellaneous*	16	43%	—	66	92%	—
TOTAL	37	—	1%	72	—	1%
Totals from all sources:						
Flue-cured tobacco	940	—	20%	961	—	20%
Maize	1,265	—	27%	1,338	—	29%
Other crops	1,093	—	23%	794	—	17%
Department of Conservation and Extension:						
(*a*) Field trials and demonstrations in European and African Purchase areas	151	—	3%	151	—	3%
(*b*) Test demonstration plots in Tribal Trust areas	632	—	14%	599	—	13%
African farmers' crops	89	—	2%	123	—	3%
Miscellaneous*	494	—	11%	702	—	15%
GRAND TOTAL	4,664	—	—	4,668	—	—

*"Miscellaneous" includes: private gardens and sports clubs; analyses for diagnostic purposes and liming recommendations only; analyses for non-agricultural purposes.

Aflatoxin Research

The Aflatoxin Research Team set up within the department in October, 1964, has carried out three major projects during the 1965 growing season:

Project No. 1—A survey of aflatoxin contamination in the commercial groundnut crop as accepted by the Grain Marketing Board.

Project No. 2—An investigation into the stages at which the groundnut crop is infected with *Aspergillus flavus* and when aflatoxin accumulation occurs.

Project No. 3—A comparison of different methods of curing groundnuts and their effect on aflatoxin contamination.

From these projects and other minor investigations arising from, or complementary to, them the Aflatoxin Research Laboratory has analysed 2,542 groundnut samples for aflatoxin content. These and other data from the experiments are being coded for computer sorting. Although the full results are not yet available, there are clear indications that valuable information will emerge regarding the factors affecting the incidence and level of aflatoxin contamination of groundnuts in Rhodesia.

Soil Survey

Surveys completed during the year include:

1. Two separate surveys covering a large tract of about half a million acres, extending from the Lundi River in the east to the Nuanetsi River in the west. Within this tract sufficient irrigable land has been found and demarcated to utilize all the water that will be available for irrigation from the proposed Lundi-Tendi dam.
2. A survey of a further area, of about 80,000 acres in extent, to the west of the Nuanetsi River. About 33,000 acres can be recommended for irrigation, which is considerably more than can be irrigated with the water available from the proposed Nuanetsi-Manyoshi dam, which commands the area.
3. A reconnaissance survey of about 150,000 acres lying between the Lundi River and Matibi No. 2 Tribal Trust Land, and commanded by the proposed Tokwe-Mukorsi dam. About 46,000 acres are suitable for irrigation.
4. A reconnaissance survey of about 75,000 acres in the West Nicholson area, of which about 6,500 acres are suitable for irrigation. The area is commandable from a dam site on the Umzingwane River, but the irrigable areas lie a long way from the dam site.
5. A survey covering about 70,000 acres in the lower Mazoe Valley near Shamva. The total irrigable area has not yet been calculated.
6. Two surveys covering parts of the land commanded by the Manjirenji dam.
7. Minor surveys in Tribal Trust Lands. The areas visited include the Silalabuhwa, Makwe, Ingwesi (Mphoengs), Mambali, Maitengwe, and Shashani-Antelope projects.
8. Other surveys of short duration, including the siting of the Chiredzi Research Station and an initial appraisal of the soils of the Insiza-Mayfair project.

Soil Physics

Root-depth Survey

A survey of rooting depth of crops on different soil types was carried out using gypsum blocks to measure the depth of moisture withdrawal. In the dry summer that occurred, poor crop growth on many sites resulted in limited information. Nevertheless, it was apparent that cotton, sunflowers, soya beans, groundnuts, velvet beans, kenaf, and oriental tobacco removed considerable amounts of water from below four feet; maize was in most cases somewhat shallower rooted; and potatoes, wheat, and sunnhemp appear to be relatively shallow rooted.

Hidrodensimeter Studies

This instrument enables rapid *in situ* density and moisture measurements to be made at any depth, and previous work at the Sabi Valley Experiment Station has proved its value in the Lowveld. During the past winter it was tried out under highveld conditions for the first time, using a wheat trial at the Salisbury Research Station. Water withdrawal appeared to occur to a depth of 42 inches, even though the soil at this depth remained fairly dry throughout the season. High yields were obtained, in spite of the moisture content in the top 18 inches remaining at approximately the wilting percentage for extended periods. The possible use of gypsum blocks for irrigation control was also demonstrated in this experiment.

Seasonal Moisture Deficit Studies

Further samples were taken from the Salisbury rotation trial for moisture determination to study the effects of different crops on seasonal moisture carry-over.

Studies at the Sabi Valley and Chisumbanje Experiment Stations

The research programme on the Sabi Valley and Chisumbanje Experiment Stations included studies into the relationship between irrigation frequency, aeration, and nitrogen release, and their influence on field bean development, and the effects of moisture shortage on sugar-cane growth and production. A gypsum soil-amendment trial was initiated on Class C soil using lucerne as the test crop. Studies on the effects of saline water were continued in conjunction with the Department of Conservation and Extension.

BIOMETRY

Staff and Organization

Early in 1964 Mr. A. Heyting was appointed to the post of Biometrician in the Department of Research and Specialist Services, which had been vacant for several years. He was attached, in an informal way, with the agreement of the Agricultural Research Council of Central Africa, to their biometrics team to work under the direction of the Senior Biometrician. This arrangement has worked extremely well and has the following advantages:

1. It would have been impossible for the Biometrician by himself to cope with all the biometrical work required by the department. In the past the biometrics team of the Agricultural Research Council has given valuable assistance in this field and continues to do so, and this arrangement permits far more efficient liaison and enables the Biometrician to draw on their experience and advice.
2. Much biometrical work is in practice only possible with the aid of an electronic computer. The biometrics team have developed computer programmes to cater for most of the commonly encountered designs and analyses, as well as a number that deal with special situations. Full use is made of these programmes and of the assistance of the trained Agricultural Research Council staff in the necessary computer card-punching.
3. Many jobs are, for various reasons, done with the aid of desk calculators. They involve much routine computational work in which the staff of the biometrics team are able to assist.
4. In the field of biometrics the Agricultural Research Council has facilities which are not matched by those of the Department of Research and Specialist Services. The extensive library serves as an example.

Achievements of the Past Year

As it is inevitable in taking up a new appointment, the Biometrician spent much of the year familiarizing himself with the work of visiting most Research Stations to see the various projects being undertaken.

Most of the work taken on fell under two major headings, Design Assistance and Analyses of Experimental Results. The final results of this work will, of course, form an integral part of the reports submitted by officers upon the completion of their experimental projects. Only the broad outlines of the work are given below.

Design Assistance

A scheme for a sample survey of grazing land in natural regions 3, 4 and 5

The Biometrician was asked to assist in the statistical aspects of the survey, which was initiated by the Chief Pasture Research Officer. After many experiments were conducted at Matopos and in Seki T.T.L. by the Pasture staff, a suitable sampling technique was developed for herbage sampling of the relatively scarce vegetation common in the grazing land of interest in the survey. This method is an adapted version of the Point Centred Quarter Method, described by Ralph L. Dix in the Journal of Range Management, Vol. 14, No. 2, 1961. The "P.C.Q. Calibrator", the instrument to be used in this method, was devised in conjunction with the Senior Pasture Research Officer.

Much time was spent on determining the best spacial distribution of sampling points and the number of sampling points required for a given level of precision, and the Biometrician assisted with field work at Matopos and on a farm in the Que Que area. In its present form, the method gives results which are amenable to statistical treatment.

Due to shortage of Pasture staff the survey was later abandoned. The work, however, was not wasted, as the method is now being used at Matopos Research Station for the evaluation of pastures in grazing and other veld management trials.

Aflatoxin Research

The sampling of large bulks of groundnuts to determine their aflatoxin content in meaningful units to a given precision is a complex job. Much thought and time was given to this problem at the request of the Aflatoxin Research Team of this department, without making much headway. The difficulties involved have been clearly defined but it appears impossible to proceed much further unless more staff and time is made available for basic research. Consequently it is not possible to do much, statistically speaking, with the results of the nation-wide aflatoxin surveys.

Advice was given on the design of a laboratory experiment to determine the influence of temperature and moisture on the production of aflatoxin by *aspergillus flavus*. Also, punch card formats have been devised for the recording of the results of the aflatoxin surveys in a form suitable for tabulations to be done with the aid of the electronic computer.

Makoholi Experiment Station

Advice was given on the recording of performance testing results. A lime × phosphorus trial on young Shona steers and a minimum tillage trial were designed. Most other trials on the station were discussed verbally with the Officer-in-Charge and suggestions to make these trials as efficient as possible were made. For an experiment to evaluate performance testing of bulls at two levels of nutrition in relation to the performance of their male offspring at three levels of nutrition, the optimum allocation of the available bull calves to the different treatment groups was worked out. Two visits were made to this station during the year.

Cotton Agronomy Trials at the Gatooma Research Station

All the new cotton agronomy trials whcih were authorized by the department for the 1965–66 season were discussed with the Agronomist at the Gatooma Research Station and, within the restrictions imposed by the available ground, water, staff, equipment and other facilities, the best possible experimental designs for all these trials were submitted.

Chipinga Experiment Station

All the existing trials on this station were discussed with the Officer-in-Charge and improvements were suggested wherever possible. These trials include:

(a) Management Trial
(b) Shade Trial
(c) Selection Trial.

Designs were submitted for the new trials to be started in the 1965–66 season. These are:

(a) Irrigation Trial
(b) Artificial Shade Trial
(c) Mulching Trial.

Two visits were made to this station during the year.

Rhodes Inyanga Orchards

During the visit to the orchards all existing trials were discussed in detail with the Officer-in-Charge and suggestions made for future improvements wherever possible.

Chisumbanje Cotton Ridging × Spacing Trial

A design for this trial was submitted to the Soil Physicist.

4^2 *Nitrogen × Spacing Geranium Experiment*

The design for this trial was submitted to the Horticulturist at Henderson Research Station.

Nematocide Trial at Mazoe Citrus Estates

The design of this trial was submitted to the Senior Plant Pathologist of the Plant Protection Branch.

Ammonium Phosphate Trial

The design of this trial was prepared for the Branch of Chemistry and Soil Science. The object of the experiment is to compare ammonium phosphate with ammonium sulphate plus superphosphate.

Department of Conservation and Extension

Three trials were designed for this department:

(a) Wheat and Barley herbicide trial, Umshandige I.C.A.
(b) Lime × Kraal manure × (NPK) trial, Que Que T.T.L.
(c) Sorghum Variety Trial, Darwin I.C.A.

Analysis of Experimental Results

The results of the following experiments have been analyzed during the year:

(i) A series of seed dressing experiments which was carried out by the Senior Seeds Officer.
(ii) A Peas N.P.K. and Top-dressing Trial, conducted at the Chipinga Experiment Station.
(iii) The Veld Fertilizer Trial conducted at Matopos Research Station.
(iv) Most of the results of the Veld Supplementation Trial which was done at the Makoholi Experiment Station. This trial was started in 1960 and is to be terminated in May, 1966.
(v) Varieties × Plant Population × Row Widths × Planting Dates trial on soya beans. This trial was done at the Salisbury Research Station by the Legume Branch. Seven varieties were analyzed and two regression analyses done.

(vi) Soya Bean Variety Trial. Seven varieties were analyzed and two regression analyses done. The trial was conducted at the Salisbury Research Station by the Legume Breeder.

(vii) An analysis of variation of leaf dimensions in *Becium homblei* and *Becium obovatum* was done for the Chief Botanist. The results of this analysis are shortly to be published in the Botaniska Notiser, Lund.

Numerous officers of the department have done much of the analyses of their experimental results themselves after the correct procedure had been discussed with them.

CHIPINGA EXPERIMENT STATION

A decision was taken in 1964 to establish a horticultural research station at Chipinga to examine the more practical aspects of the major agronomic problems besetting the young coffee industry. It was recognized that it was important that answers should be available before very extensive planting took place, but unfortunately it has not been possible to initiate very much development this year and there is still a long way to go before the infrastructure necessary for a research station is built up.

Meteorological Records and Climate

Considerable emphasis has been placed on this aspect and a trained meteorological observer is now employed to collect data from the usual meteorological instruments which have now been installed.

The season was notable for the low rainfall, which was ten inches below average and very poorly distributed, and also for the low winter temperatures. Ten degrees of frost was recorded on the ground.

Careful temperature records have been kept, comparing such aspects as the differences in minimum temperature between shaded and unshaded plots and between mulched and unmulched plots. The variation of temperature within coffee trees and with height above the ground has also been examined.

Coffee

The existing trials have been maintained and the coffee management trial which involves irrigation and mulching treatments has been extended to include a no-irrigation no-mulch treatment to act as a control. Yields from this trial have now been recorded for two years and some of the better treatments have consistently yielded over one ton of green coffee per acre.

Careful growth records are being made both in the various treatments of this trial and also in the plot which is artificially shaded.

A shade trial was established this year using Leucaena glauca as the shade species. This trial was laid down on a block of SL 28 coffee planted in 1964, and was later doubled in size to include three replicates on SL 34. The treatments are four densities of shade—no shade, one shade tree to two coffee trees, one shade tree to one coffee tree, and two shade trees to one coffee tree. The shade trees are being trained as single stem and will be stopped at approximately ten feet.

A variety trial was planted out this year to compare sixteen selections; the commonly grown Kenya selections and eight selections from Tanzania. Nine tree plots are used with five replications. There were unfortunately some deaths in this trial probably because it was planted in January, with bare roots, and little rain fell subsequently.

Irrigation is one of the most important factors in coffee growing in Rhodesia. Irrigation in the management trial is scheduled on a two-inch deficit using a pan factor of 0.8. Gypsum blocks have been installed this year on a mulched tree and on an irrigated tree. They are placed two, three, four and five feet from the tree and at six-inch intervals down to nine feet. Very interesting figures are being obtained from these readings and it is hoped eventually to use these blocks as a guide to the water deficit in the soil.

The survey on "elephant" beans was continued for the second successive year. The figures will be analyzed to examine the possibility of any inherited influence on the percentage of "elephant" beans occurring on any particular tree.

The existing variety trials continue to be maintained and recorded both on the station and a neighbouring farm. Three new trials were established this year, one at Shamva and two at Bikita.

The demonstration plots on rate of liming continue to be yielded and rates of nitrogen are also being examined using 50, 100, 200 and 400 lb. N. The coffee in the shade demonstration plot is yielding some very interesting results and at present it is the best looking and most vigorous coffee on the station.

Other Crops

The liming trial which was carried out last year on peas was repeated this year on the same plots and in addition an identical trial was carried out using Millet as a previous crop and applying the lime in October. Spacing inoculation and fertilization trials were also carried out on peas this season.

A soya bean phenological trial was carried out on a selection of varieties for the legume breeder.

Several herbicide trials were established, mainly phytotoxicity trials on coffee and citrus using triazines and substituted ureas. A rate of application and timing trial using dalapon on Kikuyu was started. A demonstration plot on the effect of weed control using herbicides without cultivation and with and without mulching was started in November, 1964.

Variety trials on vegetable crops such as tomatoes, sweetcorn and onions were carried out. In the case of tomatoes and sweetcorn, the varieties used originated mainly from the United States of America and some very interesting results were obtained.

A demonstration plot of 25 sugar-cane varieties was maintained for the Sabi Valley Experiment Station.

Trials on important apple problems were carried out in Melsetter. Chemical fruit thinning using "Sevin" and Napthalene acetamide at various rates and timing of spray applications was examined and the timing of 1 per cent. calcium nitrate sprays to counteract the bitter pit complex was also tested. Gypsum blocks were established in apples under three different management treatments—permanent sod, sawdust mulch and cultivation. It is hoped that these figures will indicate whether apples need to be irrigated or not in that particular locality.

Pests and Diseases

Cercospora coffeeiola is the most serious disease attacking coffee at the present time and a time of application trial using copper oxychloride was successfully completed this season. Clear indications were obtained from this trial that the important period for infection is in November– early December, which is much earlier than previously realized.

In the past two seasons a blackening of the berries has been serious. This may be caused by low temperatures on latent fungae infection, since it appears after a spell of cold weather.

Another obscure symptom noticed this season was a corkiness which appeared on the upper surface of the leaf petiole which, when severe, causes cracking and eventual leaf drop.

Leaf miner continues to be serious and two insecticide trails were carried out in conjunction with the Branch of Plant Protection.

Hortus

This magazine, devoted exclusively to horticultural topics, was first published this year and considerable interest has been evinced by the farming community in the three editions which have been published so far.

Contributions are made by the Horticultural and Plant Protection staff of the Ministry and the present circulation list is 350.

GATOOMA RESEARCH STATION

This report includes an account of the research work conducted at Gatooma by the entomologists, Mr. J. P. Tunstall and Mr. G. A. Matthews, of the Cotton Pest Research Scheme. A number of experiments, mainly with crops other than cotton, were also conducted by the Agronomy Section, for other research stations and specialist branches.

Rainfall.—Total rainfall for the growing season, October to April, inclusive, was 21·26 in. This compares with 20 in. in 1963–64, 30·61 in. in 1962–63 and 27·61 in. in 1961–62. Rainfall in the last two seasons has therefore been well below normal.

Moisture during November was insufficient for normal germination and establishment, especially with a shallow-planted crop such as cotton and adequate soil moisture conditions for the season were first obtained from rainfall over the four-day period 9th–12th December resulting in the crop being late-planted. Rainfall during December and January was satisfactory, if somewhat excessive in December, making weed control difficult. Effective rainfall ceased towards the end of February and the main flowering and boll setting took place under decreasing moisture conditions which depressed yields.

The Crop.—Some 40 million pounds of seed cotton (32,850 bales of lint) was produced, mainly from middleveld areas, from an established total of 35,000–36,000 acres harvested. This was by far the largest crop produced in Rhodesia. For comparison, production in recent years has been, in terms of running bales of lint:

1965	32,850
1964	12,551
1963	6,804
1962	1,387

Cotton Pest Control

With the successful introduction of an insecticidal method of control, the initial objectives of the Cotton Pest Research Scheme have been accomplished. However, the expanding cotton industry requires the continuation of an extensive research programme not only to determine the degree of usefulness of further insecticides as these are produced, but also to investigate alternative methods of controlling cotton insects such as the responses of the major pests to each other, e.g. sex attraction in *Diparopsis*, to plant characters, e.g. pubescence, and to possible attractants and repellants.

Sex Attraction Studies in Diparopsis

For these studies it is necessary to have very large numbers of pupae, to obtain sufficient virgin female moths for experiments on techniques to extract the attractant and male moths for use in chemosterilant work.

A pilot pupal collection scheme introduced in Malawi proved unsuccessful, but at Gatooma large numbers of pupae have been obtained with a minimum of effort and organization. Negotiations with a farmer, within reasonable distance of the Research Station, to grow the required large acreages of ratooned and annual cotton will be necessary, and although this will be expensive the success of these investigations will depend on such a scheme.

Extraction Techniques.—Extracts of the attractant have been obtained previously by using an entrainment method employing a powdered cellulose or dry ice trap. This season the attractant was also obtained by direct extraction from abdominal tips of the female using diethyl ether, dichloromethane or methanol as solvents, but tests failed to show which was the more efficient method. From a practical point of view extraction from abdominal tips requires considerably less organization and equipment.

Stability of Attractant.—The attractiveness of dichloromethane extracts shielded from light was maintained throughout an experimental period of 14 days, while that of the extract exposed to light steadily decreased, becoming ineffective after 96 to 144 hours' exposure. A diethyl ether extract obtained during April– early May, 1964, and stored in the dark was still found to be attractive to males the following April.

Design of Trap.—Various types of traps have been compared, but the one similar in design to that used for the Japanese beetle in the U.S.A., and which was tested at Gatooma in the previous season, appeared to be most satisfactory. Traps set with the rim of the funnel at ground level gave the highest catches, while raising traps to a height of three feet reduced the size of the catch considerably. The normal height of the trap with the collecting canister resting on the ground is one foot and this gives satisfactory catches.

Moth Activity.—Setting traps baited with virgin females at two-hourly intervals showed that over 90 per cent. of male moths attracted were caught between 2200 and 0400 hours.

The Ovipositional Response of Diparopsis and Heliothis to Cotton Varietal Differences

The experiment of the previous season, in which the plant characters pubescent and glabrous were tested, was repeated by growing isolated plots of the varieties Alber 637, MU8A, Deltapine and D2 Smooth (723) within a field of maize. This arrangement induces high infestation pressure from *Heliothis*, which also attacks maize. *Diparopsis* is not a pest of maize but is attracted to the cotton.

During the season significantly less *Diparopsis* eggs were laid on the glabrous cotton than on other varieties, while most were laid on the highly pubescent MU8A. With *Heliothis*, although significantly less eggs were laid on the glabrous variety than on Albar 637, there was no difference between the pubescent MU8A and the glabrous cotton.

The results of different experiments done so far on the question of ovipositional responses to leaf and stem hairiness in cotton, by *Diparopsis* and *Heliothis* indicate that further work is necessary before it can be conclusively shown that the degree of pubescence will materially affect the incidence of *Heliothis* and *Diparopsis*, particularly if large acreages of any given variety of cotton are grown.

Aerial Spraying Trial

This was a repeat of the previous season's comparison between tractor and helicopter spraying. There was no significant difference between the yields of the two methods of application, and therefore the extra expense of using a helicopter was not warranted in a year of low rainfall and reduced yields. If cotton growers carefully select lands and have sufficient ground equipment to cover their entire acreage within three days it seems likely that the spray programme should be maintained even in fairly heavy rainfall season.

Timing of Spray Applications

In a further trial on this aspect of controlling insect pests carbaryl and D.D.T. were applied at a spray concentration of 0·5 per cent. active ingredient (a.i.) and dimethoate at 0·05 per cent. a.i. by means of a knapsack with tailboom. From 5 to 20 gallons of spray per acre were applied, depending on plant size.

Although *Diparopsis* egg populations were slightly greater than in the previous season, they were not at a sufficiently high level to have a marked effect on yield. *Heliothis* egg populations were lower than in the previous season, but where there was any delay in the application of the appropriate spray there was a drop in yield and in the estimated financial return to the grower. The importance of controlling *Heliothis* early in the season was again emphasized.

Carbaryl/D.D.T./Endosulfan Trial

This trial was designed to assess the effect of mixtures of carbaryl and D.D.T., and of endosulfan compared with current recommendations using carbaryl or D.D.T., the latter being formulated either as a 75 per cent. highly micronized wettable powder, or as a 25 per cent. emulsifiable concentrate. Dimethoate at a concentration of 0·05 per cent. a.i. was applied when necessary for aphid and red spider control. While there were no significant differences in yield between treatments, estimates of monetary returns to the grower indicate that in general there was less profit using either the mixtures or endosulfan compared with the application of the recommended insecticides for different pests based on scouting. While the use of certain carbaryl/D.D.T. mixtures improved the control of *Diparopsis*, nevertheless to be of economic benefit and to minimize the build-up of resistance there is no doubt that the application of mixtures should be limited during the season, in accordance with scouting records.

Cotton Plant Breeding

Most of the plant breeding material at Gatooma was planted with supplementary irrigation between the 18th and 20th October. Dryland trials were planted during the last week in November.

Preliminary Variety Trials

Two trials were conducted at Gatooma and one at Chisumbanje. The main trial at Gatooma was planted under irrigation and American varieties again filled most of the top places with the highest yield from one of the Del Cerro strains, a long staple Upland type from Arizona. In the other trial, a series of predominantly African varieties were tested and those which showed up best were Nigerian derivatives of Allen and certain Barbeton strains.

Eighteen strains have been retained for further testing. Twelve of these have been crossed on to Albar 637 for a Top Cross Trial to be conducted at Gatooma and Triangle.

Replicated Progeny Trial

Trials comparing 44 progenies and five controls were conducted at Gatooma and Sabi Stations. The mean yield of lint in the Gatooma trial was 740 lb. and in the Sabi trial 1,277 lb. per acre with ginning out-turns of 34·7 and 34·3 per cent. respectively, and the mean upper half mean length and Micronaire values were 35/32nds and 3·6, respectively, at Gatooma, and 37/32nds and 4·4 at Sabi. Fifteen strains were selected on the basis of good overall performance in these trials and five on poor performance.

Selected strains go forward to the Small Bulk Trial at Gatooma, and single plant selections from selected strains will form the Replicated Progeny Trial in 1965–66.

Dialled Trial

The Diallel Trial, consisting of all possible combinations, including selfs and reciprocals, of twelve progenies selected in earlier progeny trials was planted at Gatooma. As a result of this trial 21 combinations were selected and the F_1 plants of these combinations were transplanted from the trial to give a reconstituted base population for further selection. Single plants of the original twelve parent strains have also been planted from the trial to give an original base population.

District Variety Trials

Trials were conducted at nine locations in Rhodesia and four in Zambia. Complete analyses have been conducted on all Rhodesian trials and on two Zambia trials.

	Lint yield lbs. per acre	*Mean upper half means in 32nds.*	*Micronaire values*
Bindura	611	34·5	3·5
Gatooma	451	33·9	3·6
Mazoe	759	33·6	3·6
Macheke	562	34·9	4·1
Devuli	990	37·0	4·5
Sabi	931	37·4	4·3
Triangle	1,129	35·6	4·3
Beitbridge	786	34·2	4·5
Odzi	452	34·5	4·2
Mt. Makulu	—	34·7	4·2
Msekene	—	32·5	3·6

The familiar site-to-site variation in fibre characters was apparent, but this year there was a significant variety × location interaction.

Inter-Territorial Variety Trials

Inter-territorial variety trials were conducted at Gatooma and Sabi in Rhodesia, Makanga in Malawi, Mount Makulu in Zambia and at several sites in South Africa. They contained two West African strains, three Barbeton strains, Acala 4–42, Cape Acala, Bancroft, Albar 637 from Rhodesia, Albar 637 from Malawi, Albar 63C and Deltapine Smooth Leaf. The results have not been fully analyzed but a stirking feature is the generally good performance of Allen derivatives whether developed in Central or West Africa.

Host Plant Resistance

Work continued on host plant resistance studies but the results of trials cannot be utilized as all glandless strains were virtually destroyed by chafer beetles soon after emergence. This work will continue with additional research into the establishment of glandless varieties.

Cotton Agronomy

Unless otherwise stated the following treatments apply generally in the Cotton Agronomy trials: Albar 637 acid delinted cotton seed was planted at a spacing of 3 ft. 0 in. × 6 in.; the fertilizers N as calcium ammonium nitrate, P_2O_5 as single superphosphates and K_2O as muriate of potash were applied. Again, unless stated to the contrary, trials were grown under dryland conditions.

The following is a summary of the cotton agronomy trials planted and the main results obtained:

Spacing Trial

In a trial planted to compare between-row spacings of 2 ft. 6 in., 3 ft. 0 in. and 3 ft. 6 in. and in-row spacings of 6 in., 9 in., 12 in. with one plant per station, a mean yield of 1,235 lb. seed cotton per acre was obtained. There were no significant increases in yield due to treatments although the interaction between between-row and in-row spacings was significant ($P=0\cdot05$). Also, boll size was increased significantly both for between-row and in-row spacings (linear $P=0\cdot001$) and again the interaction was significant. The weight of monopodia per plot increased with increased between-row and in-row spacings.

Plant height was not affected by spacing treatments but ground cover was inversely proportional to between-row spacings, so that as spacing decreased so percentage round cover increased. Flower production was not affected by spacing treatments.

Nitrogen × Phosphorous × Spacing Trial

In this trial the treatments were: N—0, 30, 60 lb. per acre; P_2O_5—0, 40, 80 lb. per acre; and spacings—2 ft. 6 in., 3 ft. 0 in., 3 ft. 6 in. (all × 6 in.) and the mean yield was 669 lb. seed cotton per acre. Phosphorous gave rise to significant linear increase in both yield ($P=0\cdot01$) and boll weight ($P=0\cdot001$). The initial status in the soil of available P_2O_5 was 14 p.p.m. (which is deficient) and N was low to marginal.

Spacing × Nitrogen × Water Trial

The treatments in this trial, planted on October 30th, were: N—20, 60, 100 lb. per acre; Spacings—2 ft. 6 in., 3 ft. 0 in., 3 ft. 6 in. (all × 6 in.). Water: Two replications were irrigated when available soil moisture was depleted by 50 per cent. and received 8·2 in in addition to rainfall, and (b) two other replications were irrigated when the available soil moisture was depleted by 75 per cent. and received 7·2 in. in addition to rainfall. Pan evaporation data was used to estimate evapotranspiration. No treatment affected yield significantly and this was disappointing particularly in the case of nitrogen, the initial status of which was "medium".

Nitrogen × Phosphorus × Potash Trial

In this trial the treatments were: N—0, 75, 150; P_2O_5—0, 50, 100; K_2O—0, 50, 100 nutrients in lb. per acre, and the mean yield was 890 lb. seed cotton per acre. Potash gave a highly significant linear increase in yield ($P=0\cdot001$) and Nitrogen also gave a linear increase ($P=0\cdot05$). The interaction was also significant indicating that with higher rates of nitrogen there was an increased response to potash and *vice versa*. Soil analysis indicated that the initial status of N was very low and that P_2O_5 and K_2O were deficient.

Herbicide Trials

Of 14 pre-emergence herbicides, and one mixture of two herbicides, applied in a screening trial, none suppressed yield when compared with control. From visual observations the following herbicides showed promise of controlling:

Rottboellia exaltata (Shamva grass): Prometryne, Diuron, D.C.P.A., Monuron and EH 1318.

Eleusine indica (Ropoko grass): Ametryne, D.C.P.A., Monuron, H.S.951, Trifluralin, C–2059, H.7531, EH. 1318, and UC.22463.

Broadleafed weeds: Monuron, C–2059, UC.22463.

The dependence of the great majority of the herbicides on rainfall for effective action was well illustrated by the fact that in two replications 0·5 in. of rain fell immediately after application and here control was markedly superior to that obtained in the third replication which was exposed to dry weather for six days after application. Soil samples were taken for bioassay observations 20 weeks after the logarithmic application of five pre-emergenge herbicides, in a series of demonstration plots. It was obvious from a number of cultivated plants killed after germination in the soil tested that there were active residues and further work is planned on this aspect.

In a third trial, eight post-emergence herbicides were screened in three replications. There was a certain amount of phytotoxicity and yields from the first two replications showed close correlation with final stand. Mean yield of these replications was 1,420 lb. seed cotton per acre. The degree of weed control was promising.

Time of Planting with Supplementary Irrigation

In this the treatments were: Times of planting—6th and 20th October, 3rd and 17th November, and 1st December. Plots were kept as near optimum moisture as possible with irrigations scheduled by pan evaporation. The mean yield of the trial was 2,834 lb. seed cotton per acre.

The yields obtained were as follows:

6th October planting	3,053
20th October planting	2,634
3rd November planting	2,753
17th November planting	2,969
1st December planting	2,758

but the reasons for these yield differences is not at present understood.

From records of daily white flower counts the period of flowering was reduced by six weeks by delaying the planting date from the 6th October to the 1st December.

Method of Planting Trial

Cotton Seed was planted in the normal way, i.e. between tractor wheel tracks and into semi-compacted soil, i.e. with planter units mounted to sow the seed in the tractor wheel tracks. The mean yield of the trial was 1,142 lb. seed cotton per acre but there was no difference between treatments although the semi-compacted soil did give rise to more vigorous plants during the first few weeks growth. Differences in green weight of plants, plant height, numbers of buds and bolls formed, although at first quite marked, were practically eliminated some twelve weeks after germination.

Seed Dressing × Seed Size Trial

Nine different seed dressings all in combination with two seed weights (10·47 and 8·53 gms. per 100 seeds) were compared. The mean yield of the trial was 1,229 lb. seed cotton per acre, but neither seed dressings nor seed size affected yields significantly. Similarly, the percentage germination between treatments was not significant.

Topping Trial

Plants were either not topped, or they were topped at four nodes below the growing point at six weeks and at nine weeks after the onset of flowering. There were no significant differences between treatments either in yield or in the quantity of trash in the seed cotton.

Off-Station Cotton Trials

A fertilizer trial planted on sandveld in the Gatooma area, comparing the treatments N at 0, 50, 100 and K_2O at 0, 50, 100 lb. nutrients per acre and flat vs. ridge cultivation gave a mean yield of 522 lb. seed cotton per acre, but no useful results were obtained due to poor control of weeds and insect pests.

A spacing trial planted in the Raffingora area, in which between-row spacings of 2 ft. 6 in., 3 ft. 0 in. and 3 ft. 6 in. and in-row spacings of 6 in. and 12 in. were compared, gave a mean yield of approximately 1,930 lb. seed cotton per acre, but there were no significant differences between treatments.

Results of certain cotton extension trials were not available at the time of writing. These included a spacing trial at Nan Terra Farm, Bindura; comparisons between certain Fertilizer × Time of Planting treatments at Sentinel Ranch, Limpopo; and trials on three different sandveld farms in which applications of N at three levels and flat vs. ridge cultivation treatments were compared.

On Station Trials for other Stations and Branches, mostly with Crops other than Cotton

The results of these trials will be reported by the stations and branches concerned.

Maize and Sorghum Variety Trials.
Soya Bean and Groundnut Variety Trials.
Maize Variety × Spacing Trial.
Soya Bean and Groundnut Variety Maturity Observations.
Groundnut Termite Damage × Method of Drying Trial.
Observations on Cotton/Maize Rooting Depth/Moisture Extraction.
Sugar-cane Smut Susceptibility Plots.

GRASSLANDS RESEARCH STATION

(including Eastern Highlands Research Station)

The station's work for the year, both at Marandellas and at Melsetter, has been devoted mainly to solving the problems of beef production.

Animal Husbandry

Work with beef cattle, dairy cattle and sheep has been continued. With beef cattle, work on the "beef-feeding route-map" has shown that the most likely means of substantially increasing beef output is to change from the customary spring calving to autumn calving. In tests of feeds, molasses meal, of which large quantities will be available as a by-product of making sugar, has been shown to be an effective partial replacement for maize in fattening rations. Comparisons of worm remedies have shown that Haloxon and Thiabendazole are effective with cattle while the better-known cheaper remedies are not.

With dairy cattle, study of ways and means of cheapening milk production have been continued. Lucerne soilage, fed with crushed maize, has been found to be a satisfactory replacement for conventional concentrates in winter milking rations. And, for the third year running, crushed maize has been found to give as good a yield of milk, from cows on moderately fertilized summer pastures, as concentrates of higher vegetable-protein content.

With sheep, studies of fat lamb production and of internal parasites have been continued. In experiments in cross-breeding to improve lamb-carcass-conformation the Hampshire Down, of those tried so far, has been found the best breed to use for improving on grade German Merinos. Studies of internal parasites have revealed unexpectedly large numbers of species, some of them common to cattle and buck.

Pasture Research

Work with planted pastures and the veld, in support of the work with animals, was continued as usual. In grazing trials of the best of recently-selected grasses, steers gained at rates amounting to 570 lb. per acre from mid-December to mid-June, and it is noteworthy that half of this gain was made after the end of the rains early in February. Studies of the germination of the seed of recent grass-selections have been started.

Five legumes, of the 125 tried, have been selected as being productive, persistent, tolerant of frequent cutting and grazing, and therefore likely to be suitable as pasture legumes. They are Lotononis bainesii, Trifolium semipilosum, Desmodium intortum, Stylosanthes guianensis, and Stylosanthes fruticosa. In a fertilizer trial with the first of these it has been found that it will grow happily on virgin sandveld with the addition of only single superphosphate. Moderate success in a different season has attended attempts to seed Stylosanthes guianensis into the veld to improve the value of the grazing.

Desmodium intortum and the two species of Stylosanthes have been found to be resistant to root-knot eelworm, and, with the help of the Tobacco Research Board, very encouraging progress has been made in selecting eelworm-resistant strains of Lotononis bainesii and Trifolium semipilosum.

In a re-assessment of the summer carrying capacity of natural veld grazing at much higher stocking rates than have been customary hitherto, the following results have been obtained:

System stocking-rate steers per 100 acres	*System grazing-rate acres per steer*	*Gain in weight from December to May inclusive*	
		lb. per head	*lb. per acre*
20	5·00	265	53
15	6·67	271	41
12	8·33	288	35

These gains have been obtained with no apparent damage to the veld, and are much greater than had been thought feasible hitherto; even so, they must be seen in relation to the gain of 570 lb. per acre from planted pastures given in the first paragraph of this section of the report.

In trials of arboricides for bush control Messrs. Fisons Pest Control have found that Tordon 22K severely damages the coppice of MuSasa and MuNhondo.

In a study of the residual fertility from grass leys it has been found again, as on previous occasions, that the yield of the crop following the ley, in this case millet, is inversely related to the amount of nitrogen applied to the ley and the amount of grass harvested from it. This is thought to be due to a proportionate depletion, by the grass removed, of some plant-nutrient not taken into account.

About 140 lots of seed of grasses and legumes and 135 lots of grass roots were issued during the year. Small samples of seed and roots of the new Paraguay Paspalum were given to farmers for trial. Many farmers came to the station for roots of Maguga Star Grass.

Agronomy

Work with groundnuts, maize, soya beans and soil productivity was continued during the year. The Valencia type of groundnut has been confirmed as being better suited to the high-rainfall high-sandveld than the Natal Common type, and among the Valencia types the Ukiriguru variety has been outstanding. Yields of groundnuts are found to be greatest with about 116,000 plants per acre in 18 in. rows. Lime, applied to the crop preceding groundnuts on virgin sandveld, has been found to increase groundnut yields substantially.

Comparisons of varieties of maize have been made for the Salisbury Experiment Station as usual. The best in this year's trial was that due to be released next year as "S.R.14"; it gave 34½ bags per acre despite the adverse season.

Work with soya beans was largely abortive as a result of the early cessation of the rains. Two long-term experiments with soil productivity were continued.

Microbiology

In the Rhizobium laboratory selection of efficient strains of Rhizobium for use with the more important agricultural legumes has been continued, some 6,000 isolates for 35 species of legumes having been handled during the year.

Additions were made to the collection of strains of Rhizobium that is the basis of the station's work in this field. At the end of the year the collection contained 753 strains for 306 species of legumes. A special fire-proof cellar has been built to house a duplicate set of strains.

In a survey of nodulative power of Rhodesian legumes 304 species have been found to form nodules so far, and material for examination of 85 of the remaining 200-odd has been gathered.

The legume inoculant factory sold 4,285 bottles of inoculant for lucerne, soya bean, peas, beans, and clover during the year ending June 30th, 1965, this being a slight increase over last year's sales. The culture for beans was a new addition to the factory's range of cultures. The laboratory and factory jointly issued 912 cultures to other institutions for experimental purposes, some 50 of them going to eight foreign countries.

Estate

In the station's arable rotation there were 186 acres of fertilized planted pastures, 71 acres of millet, 51 acres of maize, and 41 acres of soya beans; with the adversities of the season all yields were poor. There were also 35 acres of compound allotments and 26 acres of irrigated crops, and some nine acres of trees were planted. A further 10 acres were cleared and brought under irrigation for growing maize.

The station's flocks and herds comprised 507 beef cattle, 95 dairy cattle, and 264 sheep at the end of the year. During the year 150 steers were bought and 151 sold on grazier's agreements with the Cold Storage Commission.

The average output of milk from the station's Friesland herd for all 300-day lactations completed during the year was 11,106 lb. with fat content of 3·64 per cent.

Revenue from the sale of livestock, milk, meat, and legume inoculants amounted to £12,342 for the year.

Eastern Highlands Research Station

The closure of the Eastern Highlands Research Station for financial reasons on June 30th, 1965, brought to an end the work started as a result of last year's revision of the station's policy, and there is little of moment to report except in the case of maize and wheats. Despite the adversities of the season, yields of 52 bags of maize and 13½ bags of wheat per acre were obtained in the station's first experimental attempt to grow these two crops.

HENDERSON RESEARCH STATION

Agronomy

Agronomic investigations into economically important crops have continued during the past year. These crops include maize, cotton, groundnuts and soya beans, and factors being investigated are suitability of varieties to local environmental conditions, fertilizer requirements and effects on yield of various cultural techniques. As a result of past work, it has become apparent that the full yield potential of both cotton and improved maize hybrids can only be realized in this locality if crops are planted early in summer, before the onset of the main rains in November. To achieve this, irrigation of land is necessary to germinate seed and for early establishment of the crop. In a pilot trial this year, under these conditions, maize yields of over six tons of grain per acre and yields of approximately 2,700 lb. seed cotton per acre have been obtained. These results are encouraging and it is intended that details of cultural practice and fertilizer requirements of summer supplementary irrigated crops be investigated in detail.

With a large natural potential, how best to use irrigation water on the highveld is, in fact, becoming an increasingly urgent problem and agronomic work on the station on growing lucern, winter cereals and horticultural crops is work relevant to practical needs and subjects which are being actively studied.

Research is also in progress investigating the cultivation of a number of fibre crops, including Kenaf. Economic prospects for this crop are not good but, nevertheless, valuable experience has been gained of suitable varieties, cultural and harvesting methods and susceptibility of the crop to diseases and pests under local conditions. The crop is easy to grow but extraction of the fibre, by means of retting, is not always a simple matter. Research on this station has revealed that dried Kenaf ribbons, containing less than 0·5 per cent. nitrogen, rett only very slowly, and nitrogen (as urea), when added to the liquor in retting tanks, markedly speeds up the process.

Progress has also been made in breeding yellow maize hybrids but unfortunately this work has recently received a setback with the resignation of the plant breeder.

Animal Husbandry

There has been a quickening of interest in beef production by many farmers in the higher rainfall, traditionally crop farming areas of Rhodesia. Particular interest has been shown by them in the so-called high-energy system of fattening cattle that has been developed on this station. Briefly, this feeding system is one whereby milled maize grain, cob and sheath, suitably fortified with protein, minerals and vitamin A, comprises the entire diet and this food is made available *ad lib.* to fattening cattle. Rates of gain in bodyweight over two- to four-month fattening periods have been very rapid (3–4 lb. gain daily) and carcasses have proved to be of excellent quality. Details of the nutritional requirements for protein, minerals and vitamins of cattle fed on such diets is still an active field of study by Animal Husbandry staff but there are, in addition, a number of serious problems that remain to be resolved, e.g. the development of laminitis in cattle of the Bos indicus type.

Research in ruminant nutrition has also included studies of dietry factors affecting voluntary intake of food by cattle and sheep and, in this regard, a number of important contributions to scientific knowledge of the subject have been made.

In times of drought, survival feeding of cattle may well become of some economic importance. Preliminary work on minimal nutrient requirements of cattle for survival has recently been completed but the results have yet to be critically assessed.

Pastures

Although, in the past, satisfactory use has been made of planted pastures by beef cattle, the monetary return per acre has been low when compared with cash crops such as maize and tobacco. Further, on the heavier loam soils generally used for maize production, grass leys have no pronounced beneficial effects on soil structure or on maintenance of fertility. Clearly, therefore, their cultivation can only be justified if they can compete economically with cash crops. The main object of the research work on planted and fertilized summer pastures is, therefore, to increase output of beef to levels which would be comparable to financial returns from maize. To achieve this end a number of grasses have been tested for their ability to respond to high levels of applied fertilizer (1,200 lb. calcium ammonium nitrate and 400 lb. superphosphate per acre) and to withstand high grazing pressure of five yearling steers per acre. Despite a short rainy season, bodyweight gains of over 700 lb. per acre have been achieved and these encouraging results clearly indicate the need for closer investigations of this promising avenue of work.

Fisheries

Research on the Fisheries Section of this station has been mainly into the biology of fish in impounded waters. The Mazoe and Savory dams have been selected as examples and intensive studies have been made of seasonal and depth changes in temperature and oxygen content of water. In addition, the feeding habits of fish and availability of food for the more important species have been investigated. Such information is important for the effective planning of management of dams for fish production.

The breeding habits of the important species of fish have also been studied. Thus, for example, with Tilapia it has been found that first breeding during the season starts when water temperatures are 19–20°C. while breeding stops in autumn when water temperatures are still above 20°C. The most intense breeding period is from December to January. Similar reproductive phenomena are being obtained for Barbus marequensis and Clarias mossambicus.

Intensive pond culture of fish has continued with the main objective being to produce more fish per unit area of larger individual size than hitherto. This is possible by artificial feeding or fertilizing waters or, in some way, by restricting population pressure on available food.

Serranochromis robustus and large mouth bass have been used as predators of Tilapia in an effort to control large numbers of small fish. Production of large Tilapia by this means was encouraging. Where no predators were present in ponds, only 25 per cent. of the fish weighed over 8 oz., compared with more than 80 per cent. over 8 oz. when predators were introduced. Total per acre production of fish in both cases was the same. Serranochromis is well suited to this predatory function in pond culture, for not only do they grow as rapidly as Tilapia but also breed freely. By contrast, survival of bass in ponds is low and breeding poor.

Small-Scale Intensive Farming

Three small-scale intensive farms have been established on the station over the past four years to explore problems of farming in the African Tribal areas of this country. These farm units include:

1. An 80-acre mixed crop and livestock farm comprising 20 acres of vlei, 40 acres of fill grazing and 20 acres of potentially arable land, of which eight acres are cultivated annually.
2. A six-acre crop farm where the land is cropped annually but on which no livestock production is attempted.
3. A 60-acre intensive livestock farm with fertilized pastures and on which maize is grown as forage for a small dairy herd.

While some progress has been made with these investigations (livestock carrying capacities and cash incomes have generally improved), important problems still remain unsolved. These relate mainly to a rapid depletion of soil fertility under annual cropping and the apparent inability to materially improve matters by applying artificial fertilizers. Deficiencies of several trace elements have also been observed.

The relevance of these studies of farming systems to problems of practical agriculture remain to be assessed. However, they and Henderson Research Station as a whole have become a focus of attention of African farmers, over 600 of whom have visited the station during the period under review.

On the whole this has been a successful year for the station. Not only has progress been made with formal scientific investigations, but interest by farmers in activities of the station has been high; their attendance at meetings and demonstrations and the large numbers of people seeking specialist advice has been most gratifying.

MATOPOS RESEARCH STATION

(including Nyamandhlovu, Tuli and Tjolotjo Experiment Stations)

Animal Husbandry

Beef Production

Studies on the occurrence of a genotype-environment interaction within breeds and the extent to which these differences may be influenced by different systems of selection on varying planes of nutrition are still in progress.

In the teeth studies it should be possible to indicate, in the near future, to what extent various levels of protein intake influence the eruption of teeth of Hereford and Native cattle. The influence of various minerals, e.g. calcium, phosphorus, cobalt and copper, on the erosion of the teeth, and to what extent the genetic make-up has on both eruption and erosion, are also under investigation.

In a pen fattening trial to compare sorghum head meal and corn-and-cob meal, the latter proved superior. The conversion ratio for sorghum heads was 8·62 : 1 and that for corn-and-cob meal 6·66 :1.

Mutton Production.

Selection for smooth coatedness is still continuing. Greater emphasis will be placed on the thickness of skin and the thickness of the various wool fibres to determine whether a correlation exists between growth rate, milk flow, quality of meat and the thickness of wool fibres.

It is now evident from experiments in which the effects of different pre- and post-natal planes of nutrition on the breeding performance of the ewe and growth rate of the lamb are studied, that it is necessary to feed pregnant ewes a protein concentrate six weeks before they are due to lamb down until two weeks after the first good rains. Ewes should lamb down during October–November. It is also necessary to dose at regular intervals and to vaccinate against various sheep diseases, the most important of which is entero toxaemia.

The autumn and spring lambing trials are still in progress, but insufficient data have been collected to give concrete evidence as to which of the two seasons is best suited for lambing. Indications are, however, that the spring lambing trial is the more economical.

Dairy Unit

Complete costing of the dairy unit was continued throughout the year. Total annual milk production was 42,531·0 gallons—an average production from cows in milk of 4·16 gallons per cow per day. Sixteen heifer calves were born and reared, and eleven cows were culled. A relatively large number of followers was maintained in an effort to increase the size of the milking herd.

The experiment comparing the effect of additional green feed in the diet on milk secretion and quality was continued. Planting of the green feed was delayed due to lack of water, but half the milking herd went on to irrigated forage oats in late July. Milk and butterfat analyses were carried out concurrently.

A number of small trials on the economics of feeding surplus Friesland bull calves for veal production were carried out during the year.

Pasture Research

Severe drought affected all the veld management work, particularly at Tuli and Matopos, for the second year in succession. Grass growth was greatly depressed and leaf-drop from trees was very premature —a serious factor at Tuli, where browse plays an important role.

Matopos

Veld Management—Only one experiment (four paddocks, one herd, with burning, stocking rate trial) has carried cattle throughout the year, as all other trials were destocked in January, according to plan, for a pre-burn rest. In this experiment the steers have lost less weight during the current dry season than was anticipated and, so far, supplementary feeding has not become necessary. Stocking rates range from one beast to eight acres to one beast to 18 acres, and include a continuously grazed treatment at 1 : 10. During the period November, 1964, to October, 1965, the gain per beast and per acre has been greatest at a stocking rate of 1 : 10⅔ (159 lb. and 14·9 lb. respectively) whereas in the past the continuous grazing treatment produced the greatest gain per beast and the 1 : 8 treatment the greatest gain per acre.

In this experiment the veld has withstood the treatments well although annual grasses are gradually replacing perennials at stocking rates of 1 : 8—1 : 10⅔. Bush is increasing in the continuous grazing treatment and "patch" grazing is very marked.

Harvester termites are accelerating the deterioration of paddocks stocked at 1 : 9 and heavier in the four paddocks, three herds stocking rate trial on cleared red soil. These insects are now a serious pest over the whole station, especially on red soils. A recent survey shows a strong correlation between the termites and stocking rate.

Plant Succession.—On red soils, grazing every summer or for the whole year except the late growing season has brought about the dominance of annual grasses such as *Brachiaria eruciformis* and *Eragrostis patentipilosa*. *Eragrostis patentipilosa* is dominant in plots grazed for the first half of the growing season, but in those grazed in the late growing season perennials are still dominant although basal cover is reduced.

The summer grazing treatment and grazing the whole year except during the late growing season has caused *Sporobolus spp.* and *Eragrostis spp.* to increase on sandveld at the expense of *Trachypogon spicatus* and *Elyonurus argenteus*.

Bush Control.—The burning experiments continued to demonstrate that the grass remains vigorous but that bush decreases where burning is carried out just before the onset of the rains, at intervals of three or four years. More frequent burning, particularly early in the dry season, causes deterioration of the grass cover and eventual bush encroachment.

Picloram (Tordon) has been ineffective on four thornveld and sandveld tree species when applied to the basal bark but has killed *Acacia karroo* and *Terminalia sericea* when used as a foliar spray.

Work with goats indicates that these animals can effectively control bush on the thornveld. Information on their effect, when run in large paddocks, and on their productivity, is still required.

Nyamandhlovu

Two hundred and forty acres of mixed *Commiphora Pterocarpus*-tree savanna and 190 acres of *Colophospermum mopane* tree bush savanna were ring-barked during the year. The work was carried out from November to May. After a number of adjustments a daily task of about three quarters of an acre was allotted to each labourer. The species occurring exhibited a wide range of bark characteristics, and degree of susceptibility to ringbarking. *Commiphora spp.* and *Lannea sp.* succumbed quickly, whilst *Combretum spp.* appear unaffected so far.

Observations after one year suggest that foliar sprays of picloram (Tordon) will be effective on *Acacia nilotica* but not on *Colophospermum mopane*.

Regular fixed point photographs, taken in two recently terminated long-term ecological trials, have shown dramatically the rapid growth of *Acacia nilotica* on the red loam soil. Neither complete protection nor grazing during the dry season have reduced the rate of growth under the particular condition of these experiments.

Foliar sprays of 2,4–D on *Dichapetalum cymosum* continue to give excellent initial control, but the number of shoots gradually increases during the subsequent years. The results with picloram (Tordon) after 12 months are also following this pattern.

Excavation is now an essential part of the observations carried out in trials with this species. Recent work has shown that regrowth is rapid from the vertical stems at depths down to about 24 in., and that some regrowth is also possible at depths of about 48 in. The buds at this depth do not appear to be numerous or vigorous. Poisoning the cut stem or painting a length of the stem with 2,4–D has proved successful to date. Many of the stems remain green below the part treated with herbicide. Poisoning the underground parts, whether combined with cultivation or not, seems a method more likely to produce permanent effects than foliar sprays at the present time.

Tuli

Only two veld management treatments (stocked at one beast to 30 acres) carried cattle through the 1964 dry season. In uncleared veld de-stocking of some of the heavily stocked treatments (1 : 10 and 1 : 15) became necessary as early as June, 1964, and no treatment stocked at 1 : 20 or more could be restocked before March, 1965. Those stocked at 1 : 25 could, however, carry cattle by January, 1965.

The experiment-cleared veld was also destocked during the winter of 1964 in order that Harvester termites, which had become a very serious problem, could be eradicated. Almost complete eradication was achieved by spraying with "Hododrex", at a rate of 8·66 fluid oz. per acre, but the cost was high, 10s. 3d. per acre. This experiment was restocked in March, 1965, in order to allow grass recovery.

The effects of the 1964–65 drought have not been quite so severe, and so far only two treatments (stocked at 1 : 10 and 1 : 15) have been destocked. In the cleared trial it is probable that even the 1 : 7½ treatment will carry cattle through the dry season.

Goats are rapidly creating on open woodland in the goat and cattle trial by eliminating the smaller trees and bushes. They have recently shown a liking for the bark of shrub mopane and *Grewia spp.* Bark stripping is greatly accelerating the process of bush eradication.

Ringbarking has been found to be effective in killing most of the common lowveld trees but coppice pulling seems necessary in some cases. *Combretum apiculatum* is resistant, and needs further study.

The roots of seven common tree species have now been excavated, sketched and measured.

Agronomy

The season's rainfall was characterized by a very bad distribution as well as an overall shortage. Of the 12·72 in. of rain falling between November and March, 8·40 in. fell in December. Many of the dry land trials suffered severely from drought on this account and the coefficients of variation tended to be too high for the results to be of any real value.

Maize Grain

Of the three variety trials planted, the one at Matopos failed due to drought. At Nyamandhlovu the yields were very low but the quick-maturing hybrids yielded better than the Rhodesian hybrids, and the pattern was similar at Gatooma except that the yields were somewhat better.

Sorghum Grain

Six variety trials were planted, the entries being arranged on a plant height basis in order to eliminate possible exposure effects due to varying plant heights. The two trials at Matopos were of little value due to the effects of drought. At the other centres (Tjolotjo, Nyamandhlovu, Gatooma and Makoholi), there was no definite pattern, but hybrids NK 300, NK 300A and NK 320 continued to show promise. Of the open-pollinated varieties, Feterita 11/56 outyielded the two "S" grades, Red Swazi and Framida.

In seed-rate and spacing trials on sand soils yields were greatly reduced at all centres by drought, but the trials confirmed the recommended 8–12 lb. per acre seed-rate and about 21 in. between-row spacing.

In nitrogen/phosphorus/lime trials on sand soils the dry-land trial showed no significant responses to nitrogen, phosphorus or lime although slight yield increases were recorded with increasing N and P. The supplementary irrigated counterpart showed highly significant responses (0·1 per cent.) to increasing N and P but not to lime.

Variety/seed-rate trials were planted at four centres (three in Mashonaland and one at Matopos). The superiority of hybrid NK 300 over Framida and Red Swazi was again proved and the optimum seed-rate was shown to be about 12 lb. per acre for all three.

Millet Grain

In seed-rate and spacing trials on sand soil, at Matopos and Tjolotjo, the millet (Tjolotjo Bearded) responded to a decreasing seed-rate, the maximum being at 3 lb. per acre. It also responded (0·1 per cent. significance) to increasing between-row spacings (maximum at 28 in.).

Lucerne

In a variety trial there were no significant differences between any of the ten varieties which were in their second harvest year.

In a seed-rate and spacing trial planted in March, 1963, there were no significant differences in total yield between the spacings and seed-rates used. The trend, however, indicated maximum yields at narrower spacings (12 in.) and at lower seed-rates (13 lb. per acre).

Beans

Of the 14 edible bean varieties grown, Black Valentine, Favourite and Red Canadian Wonder were the highest yielders.

The second year (cow peas) of the *sulphur trial* for the A.R.C. was severely damaged by hail, but some results were obtained.

The soya bean maturity trial laid down for the legume breeder suffered from severe miosture stress.

A groundnut trial, including four drying treatments, was laid down for the Aflatoxin Research Team.

Silage Trials

The best maize silage yields came from the later-maturing variety and there was no advantage in late cutting and only a slight yield increase was obtained by close in-row spacings.

The sorghum silage variety trial, including 14 varieties and hybrids, showed no significant differences, but the hybrids tended to yield better. The seed-rate trials gave significant yield increases up to 28 lb. per acre and the spacing trials showed that the optimum between-row spacing was 21 in.

The millet silage fertilizer trials, both dryland and irrigated, on sandveld, showed highly significant responses to increased nitrogen and phosphorus.

The comparison of a perennial with an annual silage sorghum proved that, in the second season, an annual will outyield a perennial.

Plant Breeding

In the maize variety trials, the test top-crosses did not yield as well as the commercial top-crosses as in the 1963–64 season, but this may have been a drought effect. Phenological observations were made wherever possible.

Crop Ecology

Growth analysis and soil moisture studies on sorghum were done under dry-land and irrigated conditions in order to determine growth patterns under various moisture conditions. The plots were very severely affected by lack of moisture.

Evapotranspiration studies on sorghum were carried out on the hydraulic lysimeters but these were still not functioning satisfactorily.

A depth of rooting trial was completed for the Soil Physicist.

A trial was laid down to investigate the effect of fallowing on soil moisture conditions.

Soil moisture storage studies over the dry season were also started.

Miscellaneous

In a field scale sorghum trial, 20 acres were put down to hybrid NK 300 which yielded 7½ bags per acre despite the severe drought.

Various maize trials were planted on the Shashi Irrigation Scheme during the summer and were followed by wheat and bean trials in the winter.

Tuli Experiment Station

It was not until late December, 1964, that feeding of the Tuli herd (a drought relief measure) could be stopped. The animals were kept alive on a meagre ration of cotton seed meal, maize meal and lucerne but by the time the rains broke the veld was so denuded that adequate roughage was a major problem. Had it not been for the station's irrigated lucerne, which has been invaluable, no roughage at all, other than sticks and twigs, would have been available.

The 1964–65 rainfall was insufficient to bring about a significant recovery of the veld, and in May it became necessary to sell 425 head (mostly to members of the Tuli Cattle Society) to alleviate grazing pressure. A further 30 slaughter animals and most of the weaners were due to be sold in July, but foot and mouth restrictions prevented this.

Only a small acreage was planted to dry-land crops (sorghum for silage) in 1964–65 but was a total failure. Irrigated lucerne, barley and maize did well, however.

Owing to foot and mouth restrictions the station was unable to exhibit at either the Bulawayo or Gwanda shows.

Tjolotjo Experiment Station

Crop Husbandry.—Crop yields were poor as a result of drought but enough was produced to feed the string of cattle exhibited at the Bulawayo and Wankie shows. Farm crop yields were as follows:

Sorghum:	Early Hegari	6 bags per acre.
	Feterita	4 bags per acre.
Bearded Millet:		3 bags per acre.
Ensilage:	Sweet Sorghum	4½ tons per acre.
Cow pea Hay:		1½ tons per acre.

Three experiments on Kalahari/basalt contact and six on Kalahari sand were carried out for the Agronomy Section at Matopos and one, on the contact soil, was carried out for the Agricultural Research Council. The latter was a complete failure. On the sand, wind erosion took a heavy toll of young sorghum plants but did not affect the millet. Sorghum was also affected on both soil types by army-worm but the millet, again, was unaffected. Both crops suffered from high soil temperatures on the sand, especially in sparsely populated stands.

Animal Husbandry.—Blood serum studies carried out by the Research Branch of the Department of Veterinary Services have shown that, with the exception of one of the Angoni herds studied, the Manguni, Tuli, Mashona, Angoni and Afrikander fall into distinctly different breed groups.

The following are the results obtained from the Manguni herd during 1964–65:

Calving percentage: 93·4 per cent.
Heifer calf weaning weight at 210 days: 363 lb. (66 per cent. over 350 lb., heaviest 500 lb.).
Bull calf weaning weight at 210 days: 393 lb. (81 per cent. over 350 lb., heaviest 495 lb.).

The standard for calves has now been raised and, in future, only those weighing 375 lb. (bulls) and 350 lb. (heifers) at weaning, will be kept.

The Manguni cattle did well at the Wankie and Bulawayo shows and won a number of championships and inter-breed awards. The station exhibited the heaviest cow on the Bulawayo Show—1,804 lb. A two-tooth ox weighing 1,325 lb. compared favourably with exotics of the same age.

Recording of the indigenous sheep flock has started. Lambing will start in October and selection will be based on conformation, milk production and absence of wool.

The demand, from both African and European farmers, for Manguni cattle far exceeds the supply.

MAKOHOLI EXPERIMENT STATION

Although the year under review was the most disappointing cropping season in the history of the station, it did serve as a forceful reminder that the only reliable cash crops under dry-land and sandveld conditions in Natural Region III are cattle and oriental tobacco. Rainfall for the season was 22·92 in., in itself adequate, but the distribution of 16 in. in December, with no effective rain after mid-January, spelt disaster for grain and seed crops.

The poor season did not deter visitors, however, some 845 of whom were recorded.

The two highlights of the year were developmental. The decision by the Tobacco Research Board to site their Oriental Tobacco Research Station at Makoholi was taken in July and work proceeds to make the new station fully operative in 1966–67. The second highlight was the commencement of work on the electrification of the station, to be completed in the current financial year. Whilst both these undertakings have yet to come to fruition, they can only lead to the consolidation of work, and promote the facilities and efficiency with which that work is conducted.

The valuable contribution to the work of the station by other officers of the department, the staff of the Tobacco Research Board and in particular by members of the Agricultural Research Council's Biometrics and Soil Productivity Teams is gratefully acknowledged.

Agronomy

Work in three main areas of agronomic interest was carried out in 1964–65—viz. oriental tobacco, soil productivity and varietal studies—in all, 19 projects.

Oriental Tobacco

Trials in co-operation with the Tobacco Research Board continued investigations into rotation sequences and nematode control. In spite of the adverse season, mean yields of oriental tobacco exceeded 900 lb. per acre from two experiments, and 600 lb. from the third. Oriental tobacco grown in rotation with Sabi panicum maintained its slight yield advantage over that grown in association with other crops. In 1964–65 yield advantages accruing to E.D.B. fumigation were about 100 lb. per acre compared to no fumigation, considerably lower than in previous years. Oriental planted on ridges outyielded flat plantings some 300 lb. per acre but this was probably due to the fact that the near paddy conditions during establishment in December were particularly adverse to the flat plantings. The effect of late (November) v. early (February) ploughing of love grass leys on oriental tobacco resulted in a yield advantage to the late ploughing of 200 lb. leaf per acre. The late ploughing was associated with a lower root-knot index.

An observation on nitrogen and compost rates for burley tobacco confirmed the complete unsuitability of Makoholi soils for quality production of burley leaf.

From July, the Tobacco Research Board took over direct control of all tobacco investigational work at Makoholi.

Soil Productivity

The maintenance and improvement of sandveld fertility, together with the determination of crop requirements for optimum yield, remained the prime interest of the station in agronomic matters. Increased attention was given to the role of organic matter and to investigations into tillage practice using maize as the test crop.

The first serious attempt to grow sorghum was made in this season, and the work highlighted the problem of the erratic growth of the crop frequently encountered on sandveld. The 1964–65 season was, however, so unfavourable that the nine projects conducted in the field of soil productivity provided little advance in knowledge.

The station also co-operated with the Soil Physicist in making soil moisture withdrawal observations under a range of crops as part of the rooting depths survey. One aspect of this project indicates that root development in groundnuts and sorghum was impeded by the extremely wet soil conditions existing during the establishment phase of these crops in December.

Varietal Studies

Varietal trials on maize, groundnuts, sorghums and soya beans were conducted on behalf of other stations, and will be reported by the stations concerned.

One further project on groundnuts was carried out on behalf of the Aflatoxin Research Team.

Animal Husbandry

The study designed to evaluate the usefulness of performance testing as a selection procedure for bulls, with respect to both high plane and veld conditions of nutrition, continued. Sires of differing individual merit, as predicted by their own performance test as weaners, have progeny divided between the two nutritional regimes. The second group of sires were mated in the 1964–65 breeding season, whilts the first progeny were weaned in May.

The supplementation trial on the effects of bone meal, winter protein and vitamin A on cow life-time performance entered its final year in 1965. The total weight weaned (lb.) per cow carried 1961–65 was as follows:

	No bone meal	*Bone meal*
Control	768	912
Vitamin A	822	988
Protein	1,087	1,281

Analysis of the fertility aspects of this work indicates that only the protein supplement significantly increased calving rate over the whole period of the trial.

Trials on the effects of bone meal supplementation of growing stock confirm previous trends, with the exception that there is now little differential sex response apparent. Two-year-old animals receiving bone meal were ±80 lb. heavier, and yearlings ±45 lb. heavier at peak summer weight, than their respective non-supplemented counterparts. This response appears to be confined to the growing season.

The bulking of the Sabi sheep flock continued, but no critical work was undertaken with them.

Pasture Husbandry

The one trial seeking information on the effects of differential grazing practices on cleared veld continued. The outstanding features of this work are (i) the five-fold increase in productivity resultant from clearing, (ii) the inability of goats to control *Julbernardia* regrowth.

Fish Production

Efforts to increase the output of black bass for stocking purposes were intensified in co-operation with the Department of Natural Resources and Wild Life Management and local angling societies.

RHODES INYANGA EXPERIMENT STATION

Two meetings of the Growers' Liaison Committee were held during the year and its Research Subcommittee met once.

The station's newsletter, after one issue, was absorbed by Hortus, the new horticultural journal published quarterly from Chipinga Experiment Station.

The first Horticultural Conference was held on the station in November, 1964, as was a horticultural course for Extension Officers in February, 1965.

The Inyanga Farmers' Association sponsored a "Field Weekend" for intending fruit growers in the Marandellas and Rusape areas. Over 100 people attended a very successful event.

The Secretary for Agriculture opened a Field Day on the station on 1st July, 1965, and, in spite of a maximum temperature for the day of 46°7°F., 180 people attended.

Development work on the station included the erection of a plastic roofed insect-proof greenhouse for the potato breeder and a building to house the 69 kVA. diesel generator acquired. Funds for reticulation and operation have not yet been made available.

One house for European and several for African employees were built during the year and part of the domestic water system reorganized.

Much labour has been employed in clearing the felled cypress windbreaks, and the land for the Potato Foundation Stock scheme was contoured and fenced.

Trials

Apple Management Trial (*Planted* 1962)

Differential treatments were begun in 1964, but not until the year under review did these have any measurable effects. It may be said that trees under mulch are currently growing best, but all dry-land plots suffered from water shortage in this the second "drought year" in succession. Losses due to attack by Armillaria root rot and mole rats have been severe and "Measles", commonly attributed to manganese

toxicity induced by acid soil conditions, has appeared rather suddenly on all trees of Starking. In a few cases this condition has led to actual die-back.

Soil temperatures and soil moisture records are being maintained under all soil management and irrigation treatment combinations.

Apple Screening Trial (*Planted* 1962–3–4–5)

Growth has been satisfactory, except where varieties are obviously weak on Merton 793 stock. An article describing the trial was published in Hortus No. 3, as a result of which requests were received for grafting material of several newer introductions. One hundred and twenty newer varieties, mainly from South Africa, were planted out this year.

Six other trials were continued or started during the year to investigate nutrition, pruning, phenology establishment and root growth in apples.

Peach Management Trial (*Planted* 1962)

Several deaths due to mole rat attack occurred during the year; replacements of peach seedlings grafted *in situ* have been planted.

Flowering of Culemborg, and to a smaller extent Kakamas, was extremely prolonged.

The use of paraquat sprays to control weed growth in the no-cultivation plots has proved very effective. Two overall applications were given in the 1964–65 season, with a little "spot-spraying" for individual persistent weeds.

Tree distortion in Kakamas caused by high winds becomes increasingly obvious. The mutual protection afforded by neighbouring trees in the trial does not extend to the leader tips and this is where distortion is initiated.

Peach Screening Trial (*Planted* 1964)

Growth in general was not as good as that in Peach Management Trial in its first year, possibly because of the poor rainy season.

Screening trials with Pears and Plums were started during the year, the latter on both Marianna and seedling stocks.

Raspberry Management Trial (*Planted* 1964-65)

Differential treatments comprising shallow cultivation, deep cultivation, and deep cultivation plus sawdust mulch, were imposed in the winter of 1965. Growth of Lloyd George and Malling Promise was fair, and reasonable crops are anticipated. It appears that delayed foliation may be a problem with this crop.

Berries

The strawberry variety collection has been maintained, and four English varieties hitherto grown at the Mare Dam site have recently been moved to a new nursery where irrigation should improve growth and give a better indication of their potential.

Black currant varieties imported some years ago are doing very poorly. Seed imported from Northern Ireland has germinated well and about 700 seedlings for selection have been grown in the greenhouse for ultimate open ground plantings.

Growth of gooseberry varieties introduced from Tasmania has been very promising though few fruits have so far been produced.

Although all four blueberry varieties have fruited, growth is still extremely poor and no great hopes are held for this fruit.

Root Stocks

Seven different virus indexed apple root-stocks were introduced from East Malling Research Station in February. Growth began almost immediately after planting but was naturally rather weak and ceased with very cold weather in July-August. It is intended that these should be stooled in the winter of 1966 so that actual planting material will be available during the winter of 1967.

Three nematode-resistant Okinawa peach seedlings from the U.S.A. are being grown in pots for ultimate open ground planting. It is not known for how many years this variety will need to be grown before seed production is possible. When this does happen it is hoped that the Nematologist will carry out exhaustive tests before any are released to nurserymen or growers.

Miscellaneous Crops

Maintenance of potato variety collections was continued and extended and the so-called Foundation Seed Plot was established. Facilities were provided for virus testing of potatoes and material (tobacco and Gomphrena) was propagated for this purpose.

Fertilizer (NPK) and spacing trials on Phormium tenax were planted during the year.

Some seed of newer *pyrethrum* varieties was sown in the nursery and plants of the older varieties have been distributed to various parts of the Eastern Districts. Samples of flowers from the latter are to be collected for determination of pyrethrum content.

Soil Temperatures

A start has been made on soil temperature work during 1965, and though the coverage is still limited the results obtained are of value.

In the apple management trial irrigation treatments have not had any long-term effect on temperatures, so that monthly means are neither consistently higher nor lower than in non-irrigated plots, though short term effects due to rain and irrigation doubtless occur.

Sod, at least during July, August and September, seems to have had remarkably little effect on temperatures at either 4 inch or 8 inch depths in the morning or afternoon.

These preliminary records show how great a degree of temperature control can be achieved with mulch. Whether or not modification of the soil climate in this fashion is desirable remains to be seen: shoot growth measurements being undertaken in the current season should help towards obtaining an overall picture.

Soil temperatures are also being measured in the peach management trial but no great difference between Traditional and No-Cultivation treatments have been recorded during the winter months. During the summer months, when the greatest effect of paraquat spraying is to be seen, resulting in a somewhat hard surfaced bare orchard floor, appreciable temperature differences are expected.

SABI VALLEY EXPERIMENT STATION

(including Chisumbanje Sub-Station)

Some curtailment of the work programme and staff was made during the period under review as a result of the decision taken at the Research Advisory Committee meeting in 1963. This decision, subsequently approved by the Minister for Agriculture, was based on the following considerations:

1. That sufficient information on crops of major importance to the area had been obtained from field trials conducted over the years to enable immediate expansion of their production on a commercial scale under irrigation.
2. That the intensive field and laboratory work carried out during the past five years on the water requirements of these crops had reached a satisfactory stage of completion.
3. That the opportunity would be provided for the professional officers concerned to make a critical appraisal of the agronomic and laboratory data which had accumulated, and to arrange for a backlog of results to be processed and written up for publication.
4. That water supplies from the river were likely to restrict experimental work very considerably.
5. That the strengthening of lowveld research, with a new station to be established at Chiredzi, required redistribution of staff and facilities.

It was acceded, however, that work on soil physics and on certain aspects of agronomy should continue at Sabi and at Chisumbanje and that there was, particularly, a need to extend evapotranspiration studies to sugar-cane and lucerne.

Agronomic studies were continued on cotton, maize, soya beans, wheat and beans at Sabi and on cotton and maize at Chisumbanje, and work on burley tobacco was started at both stations. In addition, the sugar-cane nurseries were maintained and records taken as in previous years with further varietal material introduced from South Africa.

The Laboratory Section concentrated on sugar-cane consumptive use studies at Sabi and Chisumbanje, and carried out preliminary investigations into aeration problems associated with valley soils, particularly the basalts, planted to beans and groundnuts.

The Animal Husbandry Section was maintained but no research was conducted.

A difficult year was experienced due to extreme and unfavourable weather conditions, but useful information was obtained during the conduct of the trials and from the results obtained. Some spectacular

yields, particularly of maize and soya beans were recorded at Sabi and of cotton, groundnuts and wheat at Chisumbanje, and the observations made on burley tobacco and on lucerne will be of value in the planning of future work on these crops.

The Sabi River level dropped rapidly in October and the flow amounted to a mere trickle during the last week when supplies of irrigation water to the Development Farm had to be reduced. The surface flow actually stopped on Saturday, 31st October, but the river came down again strongly the next day and no further shortages were experienced.

Weather

A short season of low rainfall was again recorded and during the October-December period extreme and difficult weather conditions prevailed.

The winter season was noticeably warmer and shorter than usual with few really cold spells and no frost.

The shortage of irrigation water and the complete lack of October rains retarded land preparation and resulted in poor growth and some loss of early planted non-experimental maize.

Field Crop Investigations

Due to the problems encountered in preparing the lands, the summer trials were planted late by recommended standards and the cotton yields, in particular, probably suffered accordingly. However, all experimental plantings, except for time of planting cotton and tobacco trials, were completed during November and all bulk plantings of maize by the 9th December.

Excellent stands of maize, sorghum, soya beans and sunflowers were obtained, whereas those of cotton and tobacco were generally poor by comparison.

Cotton

The dry weather conditions proved to be very favourable for cotton production in the valley and some high yields of over 5,000 lb. seed cotton per acre were reaped from early planted sections of the Development Farm and from the variety trial conducted at Chisumbanje.

Seven field trials were carried out at Sabi and one at Chisumbanje, four of which were on behalf of Gatooma Research Station. The spraying programme was commenced early in the season due to the appearance of *jassid* and *American bollworm*, particularly in variety Deltapine S.L.

Satisfactory emergence and stands were obtained generally and subsequent cotton growth appeared satisfactory with less tendency than in some previous years to excessive growth and with little visual response to different fertilizer applications.

From observations made it is reasonable to conclude that the practice of delayed thinning this past season contributes in no small measure to reduced yields.

At *Chisumbanje* the main problem was one of rapid and excessive plant growth which, along with poor anchorage conditions in wet soil, eventually resulted in collapse and prostration of plants carrying a heavy weight of bolls and, as at Sabi, direct seedling competition due to late thinning may have been a contributory factor promoting excessive vegetative growth.

The potential of the basalt lowveld for cotton production is very great, but further study of the crop with particular emphasis on methods of establishment and requirements for more normal growth is required.

Maize

Climatic conditions proved to be very favourable and were probably near ideal for maize production. The trials conducted provided useful information regarding varieties, fertilizer usage, spacing and planting methods. Yields at Chisumbanje were also the highest on record. The crops remained relatively disease free throughout the season, but considerable damage was done to cob tips due to persistent attacks by flocks of Bishop birds.

The district variety trial carried out at both Stations showed similar yield trends with single hybrids No. 52 and 60H2 giving over 40 bags grain per acre at Sabi and 36 to 38 bags at Chisumbanje. Average yields for the trials (including that of the reference variety Southern Cross which gave 24.4 and 15.9 bags) were 35.9 bags for Sabi and 31.6 bags per acre for Chisumbanje.

A comparison of short-stemmed, quick-maturing South African hybrid S.A.5 and the Salisbury hybrid No. 52, grown under a wide range of plant populations and at two levels of nitrogen fertilization, showed yield in favour of S.A.5, and comparatively little effect on grain production was observed of plant populations ranging from 17,450 to 29,000.

An observation trial designed to investigate the nitrogen requirements of maize for grain following wheat indicated that up to 80 lb. N in ammonium sulphate as initial application broadcast may be necessary to satisfy breakdown requirements of the rotavated wheat stubbled and for early growth of the maize; also, that more than 60 lb. N could be used profitably by the crop in top-dressings under these conditions.

Soya beans

A replicated experiment conducted for Salisbury Research Station compared eight varieties for yields of shelled beans. Varieties 59S.143 and N 52S.214 yielded at the rate of over 18 bags shelled beans per acre, and varieties Geduld, 54S.70 and Hood at 17.3, 16.8 and 15.4 bags, respectively. The two later maturing varieties, Columbian M8A and H.147, were severely attacked by pod borers and the yields recorded of 12.7 and 7.6 bags, respectively, do not reflect their true yield potential.

Burley Tobacco

The preliminary work on burley conducted at both stations in conjunction with the Tobacco Research Board provided some useful information and experience of growing the crop under hot, irrigated conditions.

In a nitrogen trial at Chisumbanje no serious problems were encountered in establishing a uniform stand of plants on pre-irrigated ridges and the sustained rapid growth resulted in plants well over 6 ft. tall at stalk cutting in March, when the yield was estimated at some 3,000 lb. leaf per acre.

Investigations are required into planting and irrigation methods and on the water requirements of burley for Sabi conditions; curing methods also require substantial modification.

Wheat

Very good and uniform crops of wheat were grown, especially following lucerne in the rotation at Sabi and on the black clay soils at Chisumbanje. Investigations continued on the testing and screening of varieies for yield and disease susceptibility and on fertilizer and manurial requirements for the Mopani and Acacia soil series. Yields were exceptionally high at Chisumbanje and satisfactory at Sabi. As last year the crops remained relatively free from disease, no indication of rust development being observed except at a late stage on varieties *Mazoe* and *Marodzi* at Chisumbanje. Quelea damage was light.

Two variety trials were conducted, the one following a lengthy period of cropping and the other following wheat and cotton in the rotation on Mopani soil. F769 was the highest yielding variety in both trials with variety *Sabi* (F580) ranking third and fourth respectively. Except at Chisumbanje the dwarf variety F567 was disappointing, giving only 13 to 14 bags per acre.

The wheat crops at Chisumbanje, testing 33 varieties on one-sixteenth of an acre observation plots, averaged 25.4 bags grain per acre, the highest yield of 32.4 bags being obtained from F786; 29 bags each were recorded from varieties F560, F567 and F568.

An investigation at the time of application of nitrogen to wheat showed that substantial yield responses were obtained only from nitrogenous fertilizer applied relatively early in the growth of the crop and that a late application at flowering had no effect on grain production.

A factorial trial testing the nitrogen requirements of wheat following lucerne stubble rotavated in, showed that the full dressing of 90 lb. N was required for optimum yields.

Average plot yields on Acacia soil were just under 10 bags grain as compared with 14 to 15 bags for the season on the Mopani Farm, again demonstrating the somewhat lower potential of the Acacia soil type for wheat production.

Beans

The field programme was confined to the screening for yield and disease incidence of some 28 varieties previously tested and to a re-examination of the effects and interactions of plant spacing and nitrogen levels on yields.

Yields were again erratic but confirmed that certain varieties, such as Canadian Wonder, Natal Sugar and White Processor, are capable of producing high yields of quality seed. The crops remained relatively free from disease with only a very few varieties showing slight rust manifestations.

Lucerne

A variety trial designed to study the adaptability, growth characteristics and yield of 16 varieties obtained from America, represents a wide range of genetic material. So far, varieties which show promise of being suitable for Sabi conditions include Hairy Peruvian, Caliverde, African, California Common and Moapa.

Some information on nitrogen requirements at establishment of the crop and on the prevention of insect damage to developing and mature stands was obtained.

Sugar-cane

The nurseries were maintained and 13 new varieties, received from South Africa, were added. Sucrose and fibre analyses were conducted as in previous years and cane weights taken for evaluation purposes of plant cane and of first and second ratoon material. Recently introduced varieties showing promise at the plant cane stage include varieties Co 602, Co 404, and Co 678 which yielded at the rate of 10 tons sugar per acre in 12 months.

SALISBURY RESEARCH STATION

It is disappointing to record an unfavourable season for crop production for the second successive year, particularly as rainfall was several inches above normal. Unfortunately, conditions were not suitable for planting until almost the end of November and subsequently growth was retarded, first by exceptionally heavy rain in December and January and then by lack of rain in the vital period when maize and other crops were setting grain.

Maize

It is estimated that 440,000 acres of maize were planted by Rhodesian farmers (European), and if this proves correct it is a higher acreage than any grown previously. As a result, insufficient seed of adapted Rhodesian varieties was available and it became necessary to import seed from South Africa. In addition to over 50,000 pockets of SR 52, and between 47,000 and 48,000 pockets of the double hybrids SR 11 and SR 13, a little over 9,000 pockets of seed of SA 5 and Kalahari Pearl were imported and sold. To ensure there should be no repetition of this situation the Seed Maize Association made arrangements for the production of a greatly increased quantity of seed, so that it would be possible to carry over a substantial reserve as a safeguard against unexpected fluctuations in maize plantings and unfavourable seasons for seed production.

Varietal trials were conducted in 18 areas: two were complete failures and yields in one or two were so low that results from them are of little value. The mean yields from these trials are as follows:

MEAN YIELDS OF GRAIN
(in bags of 200 lb. per acre)

Southern Cross . . 20.31	SR 11	SR 13	SR 52	SR 53	61DH6	60H2	62H28
	28·45	28·83	31·94	28·74	31·34	28·35	28·08

Although the season was generally more favourable for the quicker maturing varieties, SR 52 again gave the highest average yield. 61DH6, which is to be marketed as SR 14 for planting in the 1966–67 season, outyielded the hybrid of similar maturing rating, SR 11, by a greater margin than last year. It will be possible to recommend it for the marginal rainfall areas and for late planting with confidence following these results.

The series of trials, started in 1947, which have been concerned with the application of nitrogen to maize and have investigated this crop's response to varying amounts of nitrogen applied in different forms at various stages in the growth of the plant, either by broadcasting or banding, were concluded int he 1964–65 season. From these investigations a great deal of information is available but, as higher populations and varieties capable of substantially greater yields are now in general use, it was decided to initiate a simple trial, involving applications of Calcium Ammonium Nitrate to the variety SR 52 planted at 19,360 plants to the acre, to see whether the previous optimum application level is now too low. In the original trials applications above 80 lb. N per acre were seldom profitable; in the new trial the top level is 160 lb. Quite possibly, because of rainfall limitations when the maize was cobbing, there was only a slight increase in yield from applications above 80 lb. to the acre in this season's trial and this was not large enough to be statistically significant.

A plot was established under as near ideal conditions as possible to try and determine the yield potential of the variety SR 52. It was planted at the end of October on land where supplementary irrigation is available, half at a population level of 19,360 plants to the acre and half at 23,232. Under unfavourable weather conditions the lower planting rate gave the higher yield, 59.05 bags to the acre, probably because a severe windstorm in late January was responsible for a lot of lodging, chiefly in the high population section. Apart from unfavourably low temperatures in the latter part of the growing season it is thought that insufficient phosphates may have had a limiting effect on the yield.

The suitability of seed of imported varieties, of advanced generation Rhodesian single and double hybrids and of open-pollinated varieties as a substitute for freshly cossed seed of SR 11, SR 13 and SR 52, came under discussion when it became obvious that supplies of the latter would not be adequate to meet requirements for the 1964–65 season. It was known that the yield of double hybrids is approximately 20

per cent. lower when advanced generation seed is used, but no comparative figures were available for a single hybrid. Advanced generation seed of SR 52 was included in three trials on the station and gave yields of 50 to 55 per cent. lower than freshly crossed seed, a reduction considerably greater than that anticipated.

Wheat

The increased interest in wheat production reported last year has continued. Just over 2,000 acres were planted under irrigation in the winter of 1964 and the average yield of 9.8 bags per acre was the highest yet reached in this country. Figures for the 1965 crop are not yet available but it is certain that the acreage was considerably larger and a higher average yield is expected.

In the Eastern Districts the incidence of stem rust on the 1964 winter crop may necessitate a change in the varieties being grown. To meet such an eventuality, the maintenance of stocks of seed of a number of varieties of different genetic origin, so that all are unlikely to be susceptible to the same race of rust, appears the best safeguard and is the policy at present. More extensive irrigation facilities under Government control would facilitate the bulking of foundation seed for release to commerce. Panmure Farm would have been ideal for this purpose.

Four varieties yielded over 30 bags per acre in the 1965 replicated winter trial. Yields of this level have been made possible by the development of strong strawed varieties which can be fertilized adequately without lodging. Probably because of deficiencies in its watering, the fertilizer trial produced no fresh evidence on the amount of phosphates, potash and nitrogen required by a wheat crop, in this case Lundi, of this magnitude.

Soya Beans

In a season such as that experienced on the station the quicker maturing varieties were at a great advantage and the fact that under such conditions five varieties yielded over 12 bags an acre was considered very satisfactory. Early planting was particularly beneficial and lower plant populations also helped to increase yields. The season was peculiar in that any treatment which effectively increased the foliage of the plant was detrimental to yield, presumably because this aggravated moisture deficiencies. It will be interesting to see whether the lower plant populations under test will prove equally superior in more favourable seasons.

After a limited programme in the previous season, and one chiefly concerned with developing techniques, soya bean breeding was on an extensive scale and well over a thousand crosses were made. The planting of parent material in movable tins which could be brought under cover at flowering time was found very satisfactory, and the percentage of successful crosses was good. Some varieties proved very shy pollen producers.

An experimental planting of soya beans in the greenhouse during the winter indicated that some temperature control is very necessary as the beans made poor growth under the extremes of temperature which occur in a greenhouse without such control.

Groundnuts

As in the case of soya beans, early maturing varieties were at an advantage and some of the Valencia types yielded over 11 bags per acre of shelled nuts, a very satisfactory result. In the ecology trial the highest yields from all four varieties came from the early planting and from the rows which were spaced 20 in. apart as compared with 30 in. However, it was found that whilst the two early varieties, Valencia and Natal Common, gave higher yields at the heavier plant population rates, the two late varieties, Makulu Red and Virginia Bunch, gave theirs at the lower.

In a trial designed to measure the harmful effect on yield of Cercospora leaf spot, by spraying the control plots to prevent or limit the development of the disease, it was found that the unsprayed plots gave the higher yields. Again it is presumed that this unexpected result was due to moisture limitation and that this was less severe where a certain amount of defoliation took place because of the leaf spot.

Potatoes

Fifteen varieties, the majority of them from Holland, were compared in a trial which was planted under summer rainfall conditions on the 23rd November. Two varieties, Radosa and Multa, gave over 140 bags an acre. The variety Trianta was used in the manurial trial planted on the same day and there were significant responses in yield to kraal compost, nitrogen, phosphates and to the highest level of application of potash. The interaction between phosphates and nitrogen was highly significant and a number of other interactions were also significant. The following were the results in yields of bags of 150 lb. per acre:

YIELDS IN BAGS PER ACRE
(150 lb.)

	COMPOST			SINGLE SUPER PHOSPHATE			SULPHATE OF POTASH			
	Nil Mo	10 ton per acre M1	20 ton per acre Po	Nil P1	300 lb. per acre P2	800 lb. per acre P2	Nil Ko	100 lb. per acre K1	200 lb. per acre K2	Mean
No.	65·7	88·3	107·6	83·3	90·1	88·2	81·3	90·8	89·5	87·2
N1	104·4	123·0	138·0	107·7	124·4	133·4	116·2	117·3	131·9	121·9
N2	119·0	157·9	161·3	126·6	152·5	159·2	150·8	136·0	151·4	146·1
Mo	—	—	—	77·8	104·0	107·4	93·7	91·2	104·3	96·4
M1	—	—	—	112·4	124·0	132·6	115·4	121·3	132·4	123·1
M2	—	—	—	127·3	139·0	140·7	139·1	131·7	136·1	135·7
Po	—	—	—	—	—	—	107·0	106·7	103·8	105·9
P1	—	—	—	—	—	—	119·4	115·0	132·6	122·4
P2	—	—	—	—	—	—	121·9	122·5	136·3	127·0
Mean	—	—	—	—	—	—	116·1	114·8	124·3	

Once lighting was installed in the new greenhouse on the station, and the hours of daylight could be extended to induce more potato plants to flower, it became possible to make a considerable number of crosses. Unfortunately, as the weather became hotter the percentage of flowers which dropped became greater and a lot of potential seed was lost. In spite of this, a considerable amount of seed will be available and should produce a large number of seedlings. It is hoped that by next year the temperature control unit will be installed and conditions will be more suitable for potato breeding.

The scheme proposed by the Potato Breeder for the maintenance of virus-free stocks of seed of the Up-to-Date, Walanga and Pimpernel varieties was inaugurated and selected plants of all three were tested for freedom from virus infection by inoculation on to tobacco and gomphrena plants. The Plant Breeder is not satisfied with the Up-to-Date stocks and is hoping to obtain virus-free seed.

Use of crop Residues

A trial was started in 1954 to measure the effect on yields of maize and soya beans of different ways of using the residues from these crops. Ploughing them under, ploughing under the kraal compost which is produced after browsing by cattle, and using them as a stubble mulch are the three treatments compared with the control, from which all the residues are removed. The following are the results up to date:

YIELDS IN BAGS PER ACRE
(200 lb.)

Crop	*Season*	*Control*	*Ploughed under*	*Stubble mulch*	*Kraal compost*
Maize	1964–65	23·78	25·17	19·17	25·65
	Mean of 9	24·04	25·68	23·15	25·99
Soya beans	Mean of 2	7·2	7·80	7·94	7·60

There is little to choose between the yields resulting from ploughing the stover under and from returning it in the form of kraal compost; but in only one season, 1959–60, when the maize followed soyas and rainfall was 10 in. below normal, was the yield from the stubble mulch plots higher than that from either of these treatments. However, stubble mulching has not had the same detrimental effect on the yield of soya beans. In this trial all plots in all treatments receive 100 lb. N per acre per annum, except when soya beans are grown; and, in the presence of the nitrogen, the increased yield from the return of the organic matter has not been as great as might have been anticipated.

Residual Effect of Treatments of a Panicum Makarikari Ley

The object of this investigation was to measure the residual effects of nitrogen applied to the ley at different levels and of management treatments of the ley. Five crops of maize were grown after the breaking of the ley to measure these effects. Nitrogen was applied to the ley at 0, 80 and 160 lb. N per acre per annum for four and a half seasons and had a striking effect on the growth of the grass. Where the grass was cut for hay and removed the residual effect of the nitrogen was negligible; but where it was grazed, or left in the ley as mulch, the residual effect was approximately 9 bags of maize from the 80 N plots and 18 bags of maize from the 160 N plots.

This investigation has been completed and the full results are to be published shortly.

GWEBI COLLEGE

Introduction

The College year under review commenced on 1st October and Diploma Day was held on 14th October with Sir Albert and Lady Robinson as guests of honour.

Education

Thirty-six students sat the final diploma examinations in July, 1965: all candidates obtained the Gwebi Diploma, 19 of these being First Class. Course 16 comprised 32 students, one of whom left early on being accepted by Natal University to read agriculture, and 30, having satisfied the examiners, passed into their second year.

The short tour took the second years, Course 15, to Grasslands Research Station and to farmers in the Marandellas area: the long (main) tour was along the route Enkeldoorn, Fort Victoria, Chiredzi and return, to enable students to see something of the development taking place in the lowveld. This tour proved of tremendous value to the student body but, due to the vast distances and expense involved, can only be undertaken occasionally.

Development

The Ministry of Works continued the extensive programme of alterations and renovations to the College hostel. This work is now nearing completion. In addition, the condemned staff house, No. RG 4996, was completely renovated.

One new borehole was successfully drilled to provide irrigation facilities to the College sports fields.

The new ablution block in the African compound is nearing completion.

Production

Total rainfall, although close to the 50-year average, was concentrated in December and January, resulting in a very difficult cropping season.

Despite this crops as a whole exceeded expectations, with maize yields averaging over 19 bags per acre. The technique of spraying *systates* beetle at the adult stage has proved extremely effective in reducing the infestation at Gwebi; so much so that the Entomology Department is no longer able at all times to find soil sufficiently heavily infested for experimental purposes. As a result it is hoped to keep Lilford North under continuous maize for a further indefinite period. Legumes for hay, silage and grazing made excellent growth.

The yield of Virginia tobacco was less than anticipated, a fact which was compensated for by higher quality and a higher average price of 26·5 pence per pound. The burley yield on the other hand was satisfactory but prices showed a decline.

The following figures give the facts regarding land utilization and field production on the college farm for the year 1964–65:

Crop	*Acres*	*Production*	*Yield per Acre*
Maize grain (Broadbalk)	42·0	974 bags	23·2 bags
Maize grain (rest of farm)	168·0	3,019 bags	18·0 bags
Maize silage	15·0	238 tons	15·8 tons
Maize legume silage	33·0	606 tons	18·4 tons
Soya beans	35·0	88 bags	2·5 bags
Valencia groundnuts	5·0	26·5 bags	5·3 pod bags
Makulu Red groundnuts	6·0	41 bags	6·8 pod bags
Canadian Wonder beans	6·0	7·5 bags	1·25 bags
Natal Sugar beans	16·0	27·5 bags	1·7 bags
Potatoes	3·5	122·5 bags	35·0 bags
Soya bean hay	31·0	46 tons	1·5 tons
Virginia tobacco	8·5	7,941 lb.	934·0 lb.
Burley tobacco	0·83	1,142 lb.	1,375·0 lb.
Cotton	0·5	719 lb.	1,438·0 lb.

Note.—Bags grain maize =200 lb. net.
Bags groundnut, unshelled = 65 lb. net.
Bags ration beans =200 lb. net.
Bags soya beans =200 lb. net.
Bags potatoes =150 lb. net.

Silage yields are estimates based on the number of loads, by weight of one load.

The Friesland herd continued on the high level of production achieved in recent years. The following figures give overall herd averages for both pedigree and grade Frieslands:

Year	*Lactations*	*Milk (lb.)*	*Butterfat (lb.)*	*Butterfat (per cent.)*	*Heifers*
1955–56	31	10,225·4	368·80	3·61	5
1956–57	36	10,050·0	375·90	3·74	11
1957–58	16	10,474·2	379·74	3·63	Nil
1958–59	37	9,457·8	346·25	3·66	11
1959–60	41	9,960·0	354·06	3·61	8
1960–61	24	9,984·8	337·90	3·40	5
1961–62	34	9,872·9	349·74	3·56	14
1962–63	34	9,466·3	354·12	3·76	11
1963–64	37	9,608·0	360·6	3·75	7
1964–65	32	10,245·0	401·0	3·91	6

The Hereford herd were maintained through the winter and began calving in early September. Five young bulls were retained for sale, two eventually being transferred to Henderson Research Station, one to Grasslands Research Station, and two were sold at the Salisbury Show for 270 guineas and 210 guineas respectively.

The college pig herd has now achieved a very satisfactory standard, four young boars testing extremely well under the Pig Industry Board Scheme. Pigs sold during the past year graded as follows:

Pig	*Grade*				*Total sold*
	A	*B*	*C*	*Lean*	
Baconers	80·2%	15·3%	1·3%	3·2%	159
Porkers	79·1%	13·4%	1·5%	6·0%	67

The Blackhead Persian flock is looking extremely well and lambing has just commenced. The policy of three lambings every two years is still being followed and is entirely satisfactory.

In the Engineering Section a start was made on constructing an electrical demonstration panel for use in student instruction.

Research

Very little research was carried out, time and funds being limiting factors at the college, where student education has priority. A close link is, however, maintained with Henderson, Kutsaga and Grasslands, whilst maize variety trials were conducted in co-operation with the Salisbury Experiment Station and investigations into *systates* beetle with specialists of the Plant Protection Branch.

Student Steer Trial No. 6

This trial consists of three different groups of cross-breds and one group of pure-bred steers receiving identical treatment and providing interesting comparisons:

Group 1—Africander × Shorthorn
Group 2—Africander × Sussex
Group 3—Africander × Aberdeen Angus
Group 4—Tuli

The weight gains since their arrival are as follows, indicating that the object of winter maintenance has been successfully achieved:

Group	27.8.64 *On arrival*	20.11.64	*Gain*	4.6.65	*Gain*	16.7.65	*Gain/Loss*
1	387·7 lb.	400	12·3	583	183	583	0
2	421·3 lb.	444	22·7	623	179	619	−4
3	552·7 lb.	539	−13·7	689	150	681	−8
4	432·3 lb.	429	−3·3	603	174	608	+5

In this instance maintenance was achieved by the use of Fosmol blocks only.

In collaboration with Mr. A. J. Smith, of the University College, poultry research was conducted along the following lines during the year:

(*a*) Lighting trial demonstrating the interaction of three rearing lighting regimes. The indications are that the 12½ hour rearing treatment was the most satisfactory.

(*b*) Protein trials and calcium trials unfortunately had to be abandoned due to poor production from the birds utilized. It is hoped, however, to repeat this work next year.

(*c*) Broiler trial: In this trial stabilized fat (tallow) was substituted for maize at various levels in order to supply the necessary energy level in the diet. These results have been submitted for publication.

(*d*) Pigmentation trial: The object of this trial was to add synthetic carotenoid pigments (caraphyll 10 and canthaxanthin) at different levels in the diet to obtain a yolk colour suitable for public demand.

(*e*) Energy trials: The energy values of various Rhodesian feeds were calculated and the results will be published shortly.

(*f*) Sorghum trial: This trial is being conducted to determine the effect of the substitution of sorghum for maize in the diet on egg production.

Agricultural Shows

The college exhibited livestock at Umtali, Salisbury, Gwelo and Bulawayo. Our exhibits did rather better than usual against very strong competition. Of particular note was the award of the Champion Friesland Female at the Salisbury Show, Champion Junior Beef Female at the Midlands Show, Reserve Champion Slaughter Ox at the Manicaland Show and Reserve Champion Hereford Female at the Royal Show, Bulawayo. The student volunteers who accompanied the college show exhibit contributed much to our successes.

Advisory Council

The council held one meeting in each college term and continued to take a very active interest in college affairs. Mr. N. T. Waller, of Gwebi College Course 1, 1950–51, continued to serve as chairman. During the year the council was enlarged by the addition of three members, two representing the farming community and one the Old Gwebian Association.

Administration

Due to the very difficult staff position we were obliged to call on the assistance of a large number of outside lecturers. The college is indebted to the very helpful co-operation of many officers of our own Ministry, of other Ministries, of the University, and of members of commercial concerns, who so very willingly plugged the gaps.

CHIBERO COLLEGE

Introduction

There is a continuing increased awareness by Form IV African students of the value of the College Diploma in Agriculture offered by Chibero.

The College Advisory Council held the usual three termly meetings, and members were present at the second Diploma Day ceremony on the 28th Junly, 1965.

The Rev. H. Jesse Lawrence resigned from the council in January, 1965, and the Minister of Agriculture invited Mr. F. P. Lilford to fill the vacancy.

The Field Husbandry Section

For the second season in succession the college farm suffered a severe drought, only 20·57 in. of rain being recorded between 1st October, 1964, and 30th April, 1965, with little effective rain falling after the 25th January, 1965.

In the circumstances, the yield figures shown below can be considered to be reasonable.

Summary of Yields and Acreages of Crops Grown in 1964–65

Maize:			
Land— I	Block 4	9·5 bags per acre	8·5 acres
	Block 5	14·0 bags per acre	8·0 acres.
	Block 6	11·9 bags per acre	10·0 acres.
IV	Block 2	9·4 bags per acre	8·0 acres.
	Block 3	7·3 bags per acre	4·0 acres.
	Cont. Maize	2·3 bags per acre	3·0 acres.
	Maize/GM Rot.	6·6 bags per acre	1·5 acres.
	Silage	±20 tons per acre	8·0 acres.
Cotton:	Albar 637	1,073 lb. per acre	from 1 acre.
Sorghum:	Hybrid 610	4 bags per acre	from 1 acre.
Sunflowers:		1·67 bags per acre	from 3 acres.
Summer wheat:	Mazoe	7 bags per acre	from 2/3 acre.
	S 473	3·5 bags per acre	from 1 acre .
Groundnuts:	Valencia	2 bags per acre	from 2 acres.
Field beans:	Canadian Wonder	1·1 bags per acre	from 3½ acres.
	Natal Sugar	1·5 bags per acre	from 2½ acres.
	Velvet	2·0 bags per acre	from 2 acres.
Sunnhemp:		1 bag per acre	from 2 acres.
Rupoko:		1 bag per acre	from 2 acres
Burley tobacco:	2,115 lb. per acre at 27·16d. per lb.		from 1 acre.
Oriental tobacco:	864 lb. per acre at 33·19d. per lb.		from 2/3 acre.
Virginia tobacco:	1,754 lb. per acre at 27·72d. per lb.		from 6 acres.

Experimental

Experiments were conducted on maize, groundnuts and soya beans. The maize experiments involved a row-spacing trial in which three shapes of plant stand were tested at one plant population. A maize silage experiment involved four levels of nitrogen and two different times of application of nitrogen, the results being based on dry matter yields and protein content. The district maize variety trial, supplied by Salisbury Research Station, was also carried out.

A groundnut variety trial was performed, in which three early maturing and two late-maturing varieties were tested. A soya bean and groundnut trial, involving the effect of temperature on maturity, was conducted on behalf of the legume breeders of the Department. A groundnut drying trial was performed in conjunction with the Aflatoxin Research team.

The Animal Husbandry Section

The dairy herd made significant progress during the year. In November, 1964, total monthly production was just over 600 gallons; in March, 1965, almost 1,100 gallons; and in July, 1965, just over 1,400 gallons. Individual cows recorded daily yields of between $4\frac{1}{2}$ and $6\frac{1}{4}$ gallons at peak stages of their lactations, while monthly cream sales to the Dairy Marketing Board totalled a record 775 lb. in September, 1965.

The Mashona beef herd has responded well to limited supplementary winter feeding, following a disastrously poor summer grazing period.

Other livestock enterprises continue to make satisfactory progress, while an interesting educational experiment with African indigenous pigs from Mtoka was commenced in January, 1965.

Although the small, 2,000,000-gallon earth dam filled in December/January from two "flash" storms in the catchment area, the early cessation of rains resulted in a rapid fall in stored water, and the fish farming project had to be postponed.

The Engineering Section

The section continues to make significant contributions to the development and maintenance of facilities on the college farm, and at the same time provides a wide variety of agricultural engineering practical work and instruction for the diploma students.

Modifications and additions in the tobacco unit, a new silage bunker in Paddock II, a new farm yard ablution block, and a new animal husbandry building for egg production records and control and stock slaughtering, were completed in the year under review.

Educational

The first enrolment of a full intake of students was achieved in April, 1965, when 20 commenced in Course 5. This brought the total student compliment to the present maximum of 40, nine of whom successfully completed their diploma in July, 1965.

By the end of September, 1965, over 70 applications had been received for Course 6 in April, 1966, and consequently there was justification in proceeding with the planned and phased expansion of facilities to permit an enrolment of at least 20 in that course, and possible 25 the following year.

General

The Principal visited the Republic of South Africa, with the Minister and Secretary for Education, in May, 1965, to report on agricultural education in that country.

J. C. RAATH,

Director, Research and Specialist Services.

Department of Conservation and Extension Report for the year ended 30th September, 1965

INTRODUCTION

This is the first full year of operation as a unified department and good progress has been made with the difficult task of welding a new organization into a cohesive whole, but it will still take time to be completed satisfactorily.

The future welfare of Rhodesia is mainly dependent on the progressive development of the natural resources of the country and in particular the agricultural potential. It is generally realized that from an agricultural production point of view we have only mobilized a small fraction of the actual production capacity of the country. To achieve full development requires not only finance, but also the desire and will by its population to use the resources and facilities on sound and economic lines for the benefit of the individual and the country as a whole. For this desire to be stimulated and implemented, it is necessary that a viable, efficient and well-trained extension staff be maintained. The major difficulty in this connexion is the world shortage of technically and professionally qualified manpower and hence it is more than ever necessary to ensure that the grading structure and salary scales will be sufficiently attractive to draw qualified officers to the Service as well as to retain the experienced men in the country.

It cannot be denied that as a result of the difficulties over the past few years and the loss of a large number of well-qualified experienced officers, the industry has suffered to some extent. All of the more senior officers within the department are most concerned about the position as the "cracks" now showing up in the field due to the inability to attend to urgent problems might widen rapidly and result in a collapse of the Service to the detriment of the industry and the country. Every possible measure should be devised to prevent further deterioration and ensure that we will not only maintain, but build up a very strong and efficient advisory service, without which the country will not reap the wealth at present still unexploited, and the findings of research will not be fully utilized.

GENERAL

Organization of Staff

This past year has been most difficult from the administrative point of view as the department has been unable to either attract or retain suitably qualified administrative staff resulting in considerable additional responsibilities being shouldered by the few experienced officers in the department. However, the senior clerical post at the six provincial headquarters has now been upgraded and it is hoped this will attract more experienced staff, particularly as the new grade has a higher salary ceiling. There is now every possibility that the officers appointed to these upgraded posts will stay with the department for a longer period than has been the practice in the past, thereby building up a stable administrative branch which is so vital in a department of over 2,200 officers and employees.

Once the graded officers have assumed duty in the provinces it is intended that a maximum of administrative functions will be decentralized.

Amongst the extension staff there has also been a considerable number of staff changes, but fortunately the overall position is slightly better than last year.

The following schedule illustrates the European staff changes during the year:

EUROPEAN STAFF

Appointments		*Losses*		*Total*	
Pro./Tech. Officers	*Admin.*	*Pro./Tech. Officers*	*Admin.*	*Appts.*	*Losses*
30	19	35	24	49	59

It should be noted that of the 30 professional/technical officers appointed, ten were on contract, five transferred from other departments and 15 were straight forward new appointments.

For African staff during the year all the technical posts were up-graded and all employees benefited by increased wages, but, probably of more importance, the extension supervisors were assimilated into the Service proper.

The department has at present an establishment of 1,454 African extension staff and it is pleasing to note that in spite of the numbers involved very few have left the department, and the following figures are submitted to illustrate the position:

AFRICAN STAFF

Appointments	*Losses*
150	17

Staff Quarters

Following the 308 quarters for which funds were provided last year the department has again been successful in obtaining funds from the overall Government provision for the construction of 57 additional African staff quarters and in view of the limited funds available this progress is considered very satisfactory.

Unfortunately, the question of maintenance for the hundreds of quarters already occupied has not been resolved, but the department has submitted various suggestions whereby the maintenance can be done locally in the various provinces and thereby considerably reduce costs. A full survey is being carried out by this department to determine accurately the state of repair of these quarters.

Visits To Other Countries

During the year some 20 overseas visits were arranged for officers of this department, the purpose of which varied from participation at international conferences to study tours for improving the technical efficiency of the men concerned. Details are given in Appendix I of this report.

Representation on Committees

The directorate and branch specialists served on more than 50 boards and committees during the year. These are listed in the form of Appendix II attached to this report.

Due to the nature of our responsibilities it is essential that officers of this department are required to serve on just about all committees and boards connected with the agricultural industry.

Publications and Publicity

Officers of the department wrote a number of articles for publication during the year, the more important of which are listed in Appendix III.

The Rhodesia Agricultural Journal. The circulation of the Rhodesia Agricultural Journal has greatly increased over the years and many more people are subscribing. Hundreds of copies of each issue of the journal are sent on an exchange basis to research stations, colleges, and universities all over the world. The approximate figure of this circulation is 700 copies.

The Public Relations Officer has been very fully occupied during the year, having had regular general press releases and a number of special press articles selected for publication. He is also the editor of the Rhodesia Agricultural Journal and of the Ministry agricultural newspaper "Kunzwa".

General technical subject matter put out by the department for the guidance of staff and farmers is dealt with later on in the report under the Publications Section.

ADVISORY SERVICES

Planning

Organization

Within the Planning Branch the organization remained unchanged during the year. The main emphasis in all the work was on consolidation of the organization and training within it, and by it, of field officers. To aid the consolidation and to bring the work on to a fully national basis a considerable amount of investigational work was carried out by all the sections. After a slack period the provincial reports indicate that there is a revival of interest in farm planning and this is reflected in the demand for services to assist in planning and extension work in the field. With the increased pressure on the field staff the aim has been to simplify methods yet maintain efficiency, to ensure that they can carry out all their duties without having to devote long periods to individual exercises.

Farm Management Section

This section was wholly seconded to the department in May and was able to proceed along its chosen path of emphasizing that "farming is a business" through the medium of extension staff. To achieve this, the section was trained in extension methods and then in turn trained field staff at all levels in the department and farmers in farm management and records for business planning. They were assisted in this work by a prominent farmer who lectured in the various courses and emphasized the farmers' side of farm records.

The farm management discussion groups continued to expand. On the 4th September, 1964, there were six clubs recording; this has risen to 24 clubs on the 30th September, 1965. The central processing bureau has analyzed these records and kept the farmer members up to date with their progress. From this extension work we have been able to prepare standards of output and input which can be used by all the staff and farmers to assess levels of efficiency and indicate lines of improvement. Virginia tobacco, cotton and maize have been examined very exhaustively in this way. The integration of work study, farm management, and land use planning mentioned in the last report has continued. The emphasis today lies more with "resource planning" rather than "inclination planning" as it used to.

Work Study Section

The range of crops subjected to work study investigation was greatly widened during the year and included various aspects of flue-cured tobacco, burley tobacco, maize, cotton, sugar, fruit and vegetables, and livestock, and many publications have been issued on these subjects. This section continues to carry out a large number of extension visits to farmers, but, again great emphasis is laid on the training of field staff so that they are fully equipped to do their extension work. To aid them in this particular aspect the work study officers have themselves attended special courses in extension methods, method study and farm management. The R.T.A. Work Study Manual was revised, and manuals on cattle handling and maize harvesting were produced.

The programme for the future includes the investigation of labour and method study in African Purchase Areas to try and establish more clearly what the various cropping methods mean in terms of labour utilization by these African farmers.

Central Planning Section

This section, in line with the other sections, has laid great stress on training through the year, both by formal courses and during the various planning exercises carried out. The aim has been to ensure a standard method and sequence of carrying out planning. This section, too, was assisted in its training work by a prominent farmer.

During the year the Central Planning Team completed 20 farm plans and five ranch plans, with a total acreage of 182,134 acres. It completed agricultural potential surveys of Charama Plateau, Nemangwe, and Stapleford, with a total acreage of 366,000 acres and has carried out a broad reconnaissance survey of the Binga area of some 2,250,000 acres. Finally, nine plans from the Karoi "blitz" of last year were also completed. In carrying out this work, some of it in the lesser known parts of the country, much new information came to light and has been incorporated in our planning technique. Individuals from the team have also assisted with work at Hippo Valley and on various subdivisions, which in all have totalled some 17,000 acres. In all the Central Planning Team have studied about 3 per cent. of Rhodesia this year.

In aiming for a more flexible farm planning system the conservation farm plan has been devised. This lays more stress on land form and land layout and less on soil classification. This enables a farmer to open up his land on soundly conserved lines and allows him to take the broad soil types into consideration as well. It is a more speedy method of carrying out farm planning and is popular with farmers and extension field staff.

Topographic Section

We have been fortunate in recruiting experienced draughting and survey staff to this section this year.

Again this section has been much involved in training in the use of aerial photography and maps, two very powerful weapons in the armoury of the field worker. The major work, however, has been an intensive survey of the erosion position in the Tribal Trust Lands in the southern river catchment areas.

One-and-three-quarter million acres were studied, and as a result a comparative and objective method of erosion analysis has been developed which can be applied over the whole country. It is simple but effective and has advanced quite considerably our knowledge of the erosion position in the country. The Central Planning Team also carried out a similar survey of some 300,000 acres of Tribal Trust land in the Victoria Province.

The systematic flying of the country has continued during the year and is producing photographs of very high quality, which in turn are of great value in the current planning work.

Land-use Planning Guide

With the amalgamation of the two former Agricultural Services, it soon became clear that a new Land Use Planning Guide suitable for use in all parts of the country would have to be produced. This has proceeded steadily and several chapters are now complete and some have been published. It is hoped to complete it during the coming year.

The branch as a whole has been fortunate this year in being able to exchange ideas with other authorities doing the same type of work. We had visits from Mr. P. C. Chambers of the Directorate of Overseas Surveys and Mr. Ford Sturrock from Cambridge University. As a result of these visits the Chief Planning Officer visited the Directorate of Overseas Surveys during a visit to England in June and the Senior Agricultural Topographer also visited them and also the National Agricultural Advisory Service during a period of leave in England. The Senior Agricultural Topographer visited one of the leading British optical firms during his period of leave to examine new equipment recently developed. The Chief Planning Officer and Senior Planning Officer visited Zambia to observe planning for African settlement in November, 1964. Two Plan-

ning officers visited Borgo a Mazzanno in Italy in November. All these contacts have been most useful and, in turn, have led to further contacts which have enabled us to improve our techniques and keep them up to date.

Provincial Planning Progress

Progress this year has been retarded as a result of reduced intensity of service by field staff because of their larger areas, and also because of the imposition of charges. The most active province has been Mashonaland North, where 48 farm plans were completed. Backlogs still exist in the area and the services of the Planning Team will be needed to assist field staff.

Considerable activity, particularly tea and coffee planning in Chipinga and Melsetter took place in Manicaland. Mayo and Tsungwesi have also been active, and in Rusape the services of the Planning Team have been sought for assistance.

In Matabeleland progress is slow, but eight plans were completed in the province, most in the Shangani Filabusi group where officers of the Planning Team also assisted. In Matabeleland the Planning Team and local officers have carried out a large survey exercise in Binga.

In Mashonaland South planning has suffered from a reduction in service to European areas. This is echoed in Victoria where farm planning is virtually at a standstill, though some work is proceeding and more is requested in the lowveld.

Decreased output also applied to the Midlands, though output of special exercise work like erosion surveys have been stepped up.

Training of officers in all provinces has continued and it is felt that as a result of this and with the lifting of charges an increase in output of farm plans will occur. It is not yet generally realized that the physical examination of farms and the drawing up of a systematic plan is the best basis for good sound extension and sound land use. Victoria have worked hard on the drawing up and implementation of a catchment protection plan in the Chiredzi catchment. Much valuable work has been done and information obtained from this exercise.

The farm plan output of 91 shows a further drop from previous years, though Mashonaland North and Manicaland individually report increases over last year.

Engineering

The shortage of professional staff continues seriously to hamper the work of the branch and consequently the work has, to a considerable extent, had to be directed into those channels where the staff available will be most effective. Direct contact with the farming community has had to be curtailed and this could result in a loss of appreciation of farmer problems and needs.

During the year technical officer and technician staff of the appropriate calibre for certain requirements became available and they were appointed and have carried out their duties very successfully.

Farm Machinery Section

With the assistance of the Standing Committee on Agricultural Mechanization much valuable work has been done, particularly in training, and their assistance is greatly appreciated. It is with regret that the resignation of the committee's very able chairman, Mr. Eric Palmer, must be reported. However, the committee is fortunate in having as his successor Mr. Reg Calmeyer.

The emphasis in the section has been mainly on training, to some extent on African extension by way of field days, and on tillage investigations.

Training

With the establishment of permanent training staff at Domboshawa it has been possible to improve the quality of the courses considerably and to train African staff for the mobile training unit which is to be put into the field soon.

During the year three tractors were made available by the Standing Committee on Agricultural Mechanization but implements were in short supply and resulted in some difficulties in running courses. Some equipment will have to be acquired to overcome this difficulty.

Fifteen courses were run during the year, varying in duration from four days to two weeks. Nine of them were for farmers and farm employees, five for departmental staff and one for contractors and employees of African co-operatives. In addition several tillage demonstrations and lectures were given for other departmental courses. Comments on, and evaluations of the courses showed that they were much appreciated and achieved their objectives.

Extension

This is virtually confined to a few basic needs. The training courses reported on above are the principal means of extension followed by field days in African and European areas when possible.

African farmers need more than a few hours at a field day once or twice a year if any real impact is to be made and the mobile training unit should help overcome this difficulty.

African training/interpreting staff is drawn from the new intake for extension assistants and after a year or two they become field extension staff in appropriate areas where this training stands them in good stead for any farm machinery extension work.

European farmers still require the training courses for themselves and their employees but have now reached the stage where they also want information on more sophisticated aspects other than tractor and equipment care and use. With the programme of trials and investigations into tillage techniques and the use and development of farm machinery, some of the information needed will start becoming available soon.

Much time and effort was devoted to the preparation of the national demonstration on maize land preparation and planting which was held at Henderson Research Station on October 6th and 7th, 1965. It proved to be very worth while and was greatly appreciated by the several hundred farmers who attended. A booklet, produced in conjunction with the Work Study and Economics Sections of the Planning Branch, is available and has been distributed to all field staff and to every farmer.

Central African Ploughing Association

Once again this body had a very successful year. Interest in good land preparation is increasing and as a result standards of ploughing are improving. Although this is not a government body it is doing such good work in raising tillage standards that it is felt it should be mentioned in this report.

General

The Farm Machinery Section has made considerable progress during the year, particularly in training, and with the posts that were made available it is doing a sound and much needed job of work. The mobile training unit will, it is hoped, be only the first of such units in the field. It will provide a much more comprehensive idea of the basic need for such units and the fields in which this type of training/extension is most needed.

FARM BUILDING SECTION

The staff position continues to interfere seriously with the work of this section. It has only two specialist posts, one of which has been vacant for nearly two years. As a result the Senior Farm Building Adviser has had to confine himself almost exclusively to the production of the book on farm buildings and to such matters as are related to obtaining information necessary for its publication.

The past year has seen the largest increase in fixed capital formation in agricultural building and works since 1954 and this in a year which has shown the lowest figure for all sectors of building since 1954. Much of the building is of poor quality, many of the structures being inefficient, and the need for a satisfactory advisory service of high standard increases.

The impact of work study on the need for better design, more efficiency in the layout, pnd less waste of labour, has also increased pressure for more advice.

Flue-cured Tobacco Buildings

The use of long low barns continues to grow because of the lower capital and operating costs and evaluations to date indicate their success in producing satisfactorily cured leaf.

The interest of industry in providing structures and devices is increasing and guidance is given by the section, as required, in their design and development. The tendency towards automatic, or rather semi-automatic heating devices continues to grow as rural electrification expands and as timber for furnaces becomes progressively more depleted. Their relatively high capital and operating costs demand better standards of barn design and construction if more efficient use of the heat generated is to be ensured.

The efficiency and safe operation of heating units are also sometimes suspect and the Standards Association of Rhodesia is now drafting standard specifications of design, performance and codes of practice for safe installation and operation of these appliances.

Cattle Handling and Feeding Layouts

A concerted study was made, together with the Animal Husbandry Section of Henderson Research Station, of the structural and design requirements for high energy cattle feeding enterprises. As a result designs were produced for model layouts of feed pens at Henderson Research Station and at Mazoe Citrus Estate as well as for the attendant equipment. This work was published.

In collaboration with the Work Study Section of the Planning Branch, who have published the results, a field study was also made of cattle handling facilities on ranches.

Crop Handling and Drying

With the growth in bulk handling of maize and the consequent need for adequate control of moisture, there is a pressing need for investigations into crop drying and into methods of storing and handling grain. With the present paucity of staff and finance little can be done at present to develop methods to suit conditions in this country. The growing interest in high-energy cattle feeding has also stimulated a growing interest in crop drying and grain storage, work on this however, must remain in abeyance for the time being.

Training

Little training was done during the year other than that required for tobacco training courses and courses for other branches.

Extension

Normal extension work was virtually suspended except for those aspects which would, at the same time, provide material for, or be of benefit to, the manual on building construction.

Development and Investigatory Work

There is much development and investigation work required in order that costs may be lowered, profits raised and more efficiency introduced into all engineering aspects of agriculture.

Tillage

Thanks to the Standing Committee on Agricultural Mechanization, who made most of the equipment available, trials are now under way at Domboshawa, Grasslands and Makaholi into the effects of mouldboard and disc ploughs, set for various ploughing depths. Results from these comparisons will be most valuable when completed.

In addition, investigation is required into various systems of minimum and rough tillage to suit the different conditions throughout the country. Much of this, and other tillage investigation, will require the development of special equipment or of special trains of equipment, to do an effective and efficient job. It is hoped that this work will soon be started once the development work projected has been properly launched.

Development

With the appointment of a professional engineer for the purpose, a start is about to be made on the development and proving of farm machinery and implement trains for our conditions and systems. This, in conjunction with tillage, will lead to great benefits for all sections of the farming community.

There is also a demand for crop driers to suit the special conditions and economy of the country, and the gradual change to bulk handling and storage of grains that is taking place as well as to meet the stricter requirements for moisture content.

Drainage

No further development has taken place but recording has continued on the existing sites at Grasslands Research Station, at Thorn Park near Rusape and in the Mazoe Valley. A Water Control Committee has been formed to advise on the use of wet land and vleis and to assist in the subsequent investigations.

Soil, Veld and Water Conservation

The past two years, in particular the one under review, have again shown the need for good management if our soil, veld and water resources are to be conserved and used to good advantage. Overstocking in many areas has shown some shocking results particularly in those parts of the country worst hit by drought and where a shortage of water supplies has in many instances led to heavy overstocking near water while adequate grazing has remained out of reach.

Land protection is often inadequate both on grazing and arable land. This could be remedied by good management and suitable practices.

Training

Two induction courses of two weeks each were given at head office for extension officers, the emphasis being on causes of erosion, methods of protecting the soil, particularly arable land, and the location of suitable sites for, and the design and construction of earth dams and masonry weirs. It is intended to increase the number of courses to enable extension officers, who have not had the opportunity of attending

before, or whose work has in the past not required a working knowledge of one or more of the more important facets of soil and water conservation, to receive special instruction in order to meet the demands of their areas.

Courses for extension assistants in land protection and the use of levels are given in the provinces by provincial staff.

Chiefs' courses and courses for their subordinates on the need for conservation were very well received and well attended throughout the country. Follow-up has in some areas been most disappointing while in others it has been excellent.

Soil Conservation

Arable Areas.—In general demands for pegging have been met but there is still an overlarge proportion of land unprotected or inadequately protected, particularly in Tribal Trust lands. The position is much better in Purchase Areas but still leaves considerable room for improvement, while in European Areas protection is, on the whole, reasonable. In all sectors there is room for improvement in standards of construction and maintenance and a wet year will do much damage. However, the situation is improving and the amount of land pegged shows a great increase over that of the previous year. (See Appendix VII.)

Layout of lands in tribal areas is often poor and this makes the layout, pegging and construction of adequate works very difficult.

Land protection, or rather the lack of it, is appalling in some Tribal Trust land and there is a huge task ahead. Fortunately intimidation, which in the past has been responsible for much of the lack of progress, has decreased very considerably and with the support of the chiefs and their headmen some of the ground lost should be retrieved.

Lack of suitably trained staff has held up pegging work to some extent, but the use of chief's peggers, particularly in the Victoria Province, has alleviated the position very considerably.

Several difficulties remain which require attention. Firstly, the use of partially trained staff may result in bad layouts, inadequate designs and faulty pegging which could result in more damage than if the land were left unpegged. This can be overcome by ensuring that the training is adequate, that trainees have thoroughly absorbed their training and are adequately carrying out the work, and that supervision and guidance is adequate. Secondly, applications for pegging are often too late to fit into the season's programme. Finally, higher plant populations, better tillage, use of fertilizers and improved crop management practises are required to protect the soil.

Streambank Cultivation.—There has been a considerable deterioration in regard to streambank cultivation in Tribal Trust lands, and to a small extent in some other areas, probably because of the drought. Supervision and control are almost impossible in the worst areas at present and the position is being investigated with a view to simplifying and speeding up procedure for approving or refusing exemptions and ensuring that conditions imposed in granting exemptions can be made effective.

Roads and Railways.—The co-operation with the Ministry of Roads and Road Traffic, the Road Councils and Rhodesia Railways continues to be good and problems of erosion and water disposal are settled to mutual satisfaction.

Road Councils operate well and their roads are of a high standard, but farm roads could generally be improved. In some Purchase Areas roads are of a reasonable standard but in others and in the Tribal Areas they are usually poor to shocking, and are deteriorating. The position is often beyond the scope and ability of the local inhabitants to rectify and unless something is done soon many of these people will be cut off and the efforts to increase their production become meaningless as the transport of crops to markets will be seriously hampered. Field staff are also finding it increasingly difficult to carry out their extension and conservation duties due to the state of the roads.

Veld Management

Overstocking remains the greatest problem and the recent droughts have emphasized this and resulted in such deterioration in some areas that these will take a long time to recover even if the seasons are good. Management, although improving, is still generally poor.

Generally the position is good to fair in most European Areas, deteriorating to poor in Purchase Areas and near impossible in some Tribal lands.

Inadequate and poorly distributed water supplies remain one of the causes of maldistribution of stock and the consequent local damage to grazing in many areas. Harvester termites, too, are contributing to the destruction and in the Eastern Districts ploughing of grazing land without a proportionate decrease in stock has worsened the position.

Some progress is, however, being made in improving conditions and ring barking, which results in improved veld and a greater carrying capacity, is becoming more popular.

Veld Fires.—The incidence of veld fires has considerably decreased, mainly due to the drought but also to some degree to better control in the cattle producing areas. Unsettled or unoccupied areas have, however, been burnt out as usual and much damaging and unnecessary burning still takes place on African lands.

Bush Encroachment.—This remains a very serious problem which is worsening in some Tribal Areas because of the coppicing which follows tree felling and due to general mismanagement of the grazing. Once the problem becomes serious there is then so little grass that control by fire becomes impossible and sheet and gully erosion takes place unchecked.

Some progress is being made with chemical and mechanical measures but the greatest promise still lies in ring-barking, which is very successful if done properly.

Fencing.—In the Tribal Areas fences have not been a success so far as they are generally nobody's responsibility and are allowed to fall into disrepair. Limited progress is being made in the Purchase Areas, while on European farms the position is fairly good and improving where livestock are a part of the enterprise. Paddocks in themselves, however, are far too often considered to be good management instead of being recognized as merely tools in good livestock and veld management.

Water Conservation

Dams.—The total number of dams built has remained almost static but the total and average capacities are approximately three times greater than for the previous year because of a few large communal dams. (See Appendix VIII.) There is a rising demand for privately owned dams in Purchase Areas but these are usually small, costing generally between £100 and £250, which are financed by loans from the Agricultural Loan Fund. Applications for loans for dam building by Purchase Area farmers have been rather disappointing.

The rate of dam building generally should be far higher but this has been retarded because of the removal of subsidies and reduced farmer income due to the drought. Because of the drought and steps taken to combat it in the worst areas, the coming year could see a big increase in water conservation.

The distribution of water supplies is still not satisfactory and in certain areas supplies have been critical. The past season has highlighted this and much valuable grazing could not be utilized for lack of available water.

Two drought years in succession have emphasized that crops should be early planted with water and that supplementary irrigation is invaluable in saving crops as well as increasing production. A more general appreciation of this fact, and the role that farm dams can play in providing this water, is needed.

Other Water Supplies.—Eleven new schemes in the low rainfall areas for piping water on ranches were approved and these involved 41 miles of pipe, making a total to date of 154 miles of such supplies.

The water levels in boreholes and wells in the drought areas dropped and complete failures of supplies were reported from several areas, particularly where the holes were shallow. Many successful new boreholes and wells have been sunk.

MECHANICAL UNITS

The number of dams built by the units has decreased a little but a considerable amount of bush clearing was done for new lands, for access roads to and in areas being developed for settlement, and for game fences for the control of tsetse fly. Unfortunately the number of dams built in the lower rainfall areas has decreased but this has been offset by an increase in the higher rainfall regions. (See Appendix VIII.) This trend has reached the point where most of the fleet of machines is now employed in Mashonaland.

Over half of the machines have been overdue for replacement for some time and breakdowns have been so frequent that it is only by dint of much overtime by field staff that sufficient productive hours have been achieved to avoid losses on this working account. Two tractors have had to be boarded during the year but only one replacement was provided. Fortunately this unsatisfactory state of affairs will be partially alleviated over the next few months when further replacements are due.

Agronomy

MAJOR CROPS

Maize

Planting commenced in earnest after the rains that fell in the third week of November, and by the end of that month about half of the maize crop had been put in. With the break that occurred in the weather in early December and the accompanying rise in temperature, the crop grew vigorously and weed competition started to become a problem when wet weather later in the month prevented farmers from cultivating effectively. By the 10th December most of the crop had been planted.

Top dressing commenced towards the end of December and stalk borer control measures began.

The early planted crop commenced tasselling in mid-January, but the larger part of the maize acreage was then still at knee height. By the end of January crops in the main maize growing areas looked exceptionally promising and the conclusion was legitimately drawn that, provided rains continued to be favourable in regard to both distribution and amount, the national maize yield would be the highest on record. Unfortunately the main rains virtually came to an end in early February in Agro-Ecological Region II where most of the maize is grown, and the potential yield dropped steadily on all farms where no irrigation could be applied. In Matabeleland, Victoria and most of the Midlands rain ceased at the beginning of January and much of the maize crop was converted into silage or abandoned.

Some rain fell in Mashonaland in early March which helped many crops, but by that stage the expected yield had already been reduced by one-third. By the end of April the whole crop was maturing rapidly before the pips had been completely filled.

In June the following group average yields were reported:

Group	*Bags per acre*	*Group*	*Bags per acre*
Karoi	20	Macheke	15
Mazoe	15	Marandellas	13
Sinoia	12	Salisbury S.W.	8
Umvukwes	25	Charter	8
Banket	12	Gwelo	3
Victoria East	6	Headlands	14

Very good yields were obtained under supplementary irrigation; these varied from 25 bags/acre on certain farms in the Gwelo area to 45 bags/acre in the vicinity of Gwanda.

Up to the end of September, 1965, the Grain Marketing Board had paid for the following maize from the 1964–65 crop harvest:

European produced	3,004,989 bags
African produced	411,909 bags

Special arrangements had to be made by the Salisbury Farmers' Co-operative to import maize seed from South Africa for the 1964–65 season planting. Four thousand pockets of S.A. 5 and 1,000 pockets of Kalahari Early Pearl were thus brought into the country. S.A. 5 proved to be extremely susceptible to Helminthosporium spp. infection.

Sorghum

The characteristic of drought hardiness possessed by sorghums manifested itself once again during the 1964–65 season, reasonable yields (for the season) of up to eight bags per acre being achieved in certain areas of the Midlands such as in the Que Que group. This was a good achievement considering the amount and distribution of the rains that fell. In Matabeleland and in the Victoria and Sabi lowveld, sorghum crops were a failure, practically nothing being reaped because of the severity of the dry conditions that prevailed there. Yields in the better-watered parts of the country such as the Mazoe Valley reached 15 bags per acre.

European farmers have slowly come to realize how great a potential exists in Rhodesia for sorghum production, and in particular for that of the new high-yielding hybrids such as NK 300 and NK 300A which have consistently proved their superiority from the yield point of view in many carefully controlled trials. Indicative of this new interest is the intention of many farmers in widely scattered areas of the two Mashonaland provinces, the Midlands and Victoria, to grow on a field scale during 1965–66 new hybrids produced by American companies such as Northrop King, Asgrow and Taylor Evens.

Cotton

Climatic conditions described in the case of maize adversely affected cotton crops as well, reducing the overall national yield, it is estimated, by as much as 400 to 500 lb. seed cotton per acre. One hundred and ninety-two European and many African growers were seriously affected by having no rain after the first blossoms opened.

During the heavy rains of December, weeds grew rampantly and could not be controlled effectively on the majority of farms due to the wetness of the lands; it is estimated that about 500 acres in the Mazoe Valley had to be abandoned because of this reason. This experience brought home to growers an appreciation of the role that herbicides such as Cotoran, Prometryne and Treflan can play in cotton production.

Despite the fact that sectional reaping was not practised by many growers, the standard of picking was high and the seed cotton delivered to the gin at Gatooma was much freer of stain and trash than during the two previous seasons. This fact was a reflection, also, of the high standard of spraying carried out on the majority of European farms and on those owned by African members of producer co-operatives.

Seed cotton delivered by Africans who were not members of co-operative societies, up to the end of September was disappointing, being graded as 25.4 per cent. class A, 36.6 per cent. class B and 27.3 per cent. class C; 10.7 per cent. of deliveries by this class of producer up to the end of September, 1965, had been rejected. Almost all of this cotton was down-graded due to insect damage stain brought about by faulty spraying for insect control.

A major change in grading took place during the year in that grey cotton, which previously had been classified as B, was raised to A; there were some 400,000 lb. involved and it was ginned together with good irrigated class A seed cotton. Soil stained seed cotton, which was previously treated as B, was also up-graded to A, but in this case it was ginned separately.

Up to the end of September, 1965, nearly 39,000,000 pounds weight of seed cotton had been bought from European and African growers by the Grain Marketing Board. The final figure, including unclassifiable cotton, is expected to be 40,500,000 lb. off approximately 36,000 acres, which gives an average yield of about 1,125 lb. of seed cotton per acre.

The Cotton Advisory Officer made 343 farm visits during the year (almost always in company with the local Extension Officer in each case), addressed 49 meetings and field days and presided over three courses of in-service training for the department's European field staff in cotton production techniques and four courses for African staff. From the 1st May to the 30th September his duties, as in the case of the second Cotton Advisory Officer, who joined the Department on the 1st June, were almost completely confined to seed cotton grading at the Gatooma ginnery.

Groundnuts

Extremely severe drought conditions in the southern half of the country, particluarly in the Victoria Province which normally produces one-third of the marketed crop, made the year a poor one for groundnut growers. In Matabeleland the third successive drought year resulted in a virtual crop failure. Conditions were a little better in the Midlands and Manicaland and considerably more favourable in parts of Mashonaland, but even here poor returns were obtained. The original estimate was 385,000 bags of kernels, which subsequently was reduced to 224,000 bags. When marketing began, reports from Grain Marketing Board agents in the field indicated a probable total of not more than 176,000 bags as being available for sale. By the 30th September, 1965, only 124,000 bags of kernels had been delivered to the Grain Marketing Board.

Poor production due to seasonal conditions was intensified in its effects on deliveries to Grain Marketing Board depots by the exclusion of mouldy and diseased nuts. This exclusion was necessary to reduce the risk of Aflatoxin contamination.

Extension efforts designed to persuade Africans to standardize on colour have been successful in that Grain Marketing depots report receiving increased deliveries of pale coloured nuts which, for the sake of convenience, are now being referred to as "Rhodesian Pink".

During the 1964–65 season extension field staff co-operated closely with the Aflatoxin Research Team in carrying out a survey of groundnuts grown at 115 different sites. The object was to discover the pattern of Aflatoxin development under different soil and climatic conditions and at different stages during the harvesting and curing process. This exercise is to be repeated on a reduced scale during the 1965–66 summer.

Edible Beans, Soyas and Other Legumes

There is a great deal of scope in Rhodesia for increasing the production of edible beans which, at present, are imported in large quantities from Tanzania and Malawi. Merchants are most anxious to obtain regular supplies of the Red Canadian Wonder and Natal Sugar varieties to satisfy the large local market that exists.

Reasonably good crops of edible beans were grown in 1965 and very satisfactory yields were achieved where the standard of management was high.

Despite various efforts, interest in soya beans remained at a low ebb and only a small acreage was grown.

Velvet beans and cowpeas for dry-land fodder production were grown in adequate quantities and did well in the higher rainfall areas. In the southern half of the country little or nothing was reaped except where irrigation was employed.

Crops for Seed

During the year the following acreages were established to seed crops in the Sabi Valley by African growers:

Crop	*Acreage*
Beans	939
Lettuce	62·5
Tomatoes	22
Peas	64

It is estimated that approximately 4,400 bags of seed beans were produced by the 62 European farmers who grew this crop for merchants in 1965. Other crops that were grown for seed production purposes by Europeans were flowers, cotton, groundnuts, sorghum, wheat, potatoes and tobacco.

The total acreage that was established to certified or approved seed crops for seed production purposes during the year was 6,216. This does not include maize, which amounted to a further 7,999 acres made up of 1,103, 2,517 and 4,379 acres of SR 11, SR 13 and SR 52 respectively.

Barley, Munga and Rupoko

Good crops of winter-grown barley have been produced under irrigation by farmers in the Eastern Districts and at Umshandige on contract to the brewers of European-type beer but, because of an overall reduction in quotas, the acreage established to this crop was lower than that of last year.

Munga yielded between two and a half and four and a quarter bags per acre in Mashonaland, practically nothing in Matabeleland, and three bags in the Bikita area of Victoria which, with 24 in., had a far better rainfall than any other parts of that province during the year.

Rapoko conformed fairly closely to this pattern, varying from four bags per acre in Mashonaland North to one and a half bags in Mashonaland South. The crop failed in Matabeleland except in the Gwatemba Purchase Area where two bags per acre were reaped; it failed also in Victoria except in Bikita, Gutu and Chatsworth where, again, a yield of two bags per acre was achieved.

Wheat

Crops which, at the time of writing show every promise of yielding from 15 to 20 bags per acre, have been grown under irrigation in the Eastern Districts, in the Mazoe Valley, in the Banket area of Lomagundi, on the Sherwood Block near Que Que and in other parts of the Midlands, on the Umshandige scheme near Fort Victoria and on a number of farms in Matabeleland.

Mazoe was the variety most widely grown, but this has succumbed to stem and leaf rust attack around Umtali and Shamva and farmers in these areas are being advised to grow Umfuli and Hunyani in 1966. These two last-mentioned varieties, although developed as summer wheats by the wheat breeder, have performed exceptionally well under irrigation at Sherwood during the 1965 winter and can thus henceforward be regarded as dual purpose wheats suitable for use in either summer or winter.

Lundi, the semi-dwarf variety which has a potential of 31 bags per acre under lowveld conditions, will be grown on an increasing scale at lower altitudes as more seed becomes commercially available.

Sugar Cane

The following figures reflect the acreage of sugar production now taking place on the various estates on which this crop is grown:

Year	*Triangle*	*Hippo*	*Chirundu*	*Nandi*	*Rhodesian Wattle*	*Total*
1965	30,000	17,169	5,620	—	600	53,389

During the year Triangle Ltd. averaged 50 to 55 tons of cane to the acre and Hippo Valley Estates Ltd. almost 60. For the sake of convenience the figure of 8.5 tons of cane to one ton of raw sugar should be used when calculating the amount of raw sugar that can be expected to be produced off a given acreage in the lowveld under favourable conditions of management.

Tea

The four large tea-producing companies in Rhodesia, from their various estates in the Eastern Districts, produced 3,586,897 lb. of made tea off 6,838 acres during the year under review, and of this total 880,434 lb. were exported. Production from the present planted acreage will progressively increase and should by 1969–70, amount to about 8,000,000 lb. each year, worth almost £1,500,000.

As a result of an offer made by Rhodesia Farms and Industries (Pvt.) Ltd. to undertake to buy and process green leaf tea from farmers for processing at its Southdown factory, a survey was carried out by this department in February/March to determine the extent of suitable land in the Chipinga and Melsetter I.C.A.s which could be used for the production of this crop. This survey revealed that land and climatic conditions were most favourable for such a scheme although it would be necessary, in the case of some of the farms that were investigated, to augment the natural rainfall by means of irrigation for tea to be grown successfully.

The only African-owned tea is in the Holdenby Tribal Trust land (Honde Valley) where nine growers have established eight and a half acres of tea. From four of these acres 1,423 lb. of made tea were produced by six growers during the year ended 30th September, 1965. By January, 1966, there should be between 15 and 16 acres under tea if sufficient planting material can be obtained.

Coffee

Forty-eight European farmers or European-owned companies have, to date, established 1,153 acres of Arabica coffee in the Eastern Districts. Most of this acreage is in the Melsetter and Chipinga I.C.A.s and in the Vumba area of Umtali South I.C.A. It is envisaged that within two years the area down to coffee on European farms will have increased to about 3,500 acres.

The value of coffee harvested in 1964 by European growers amounted to £17,000; the crop reaped in 1965 will probably be worth double this figure.

African coffee growers now number 182, and the area on which their 17,011 coffee Arabica trees have been established totals, in aggregate, about 31 acres. Between them these African growers produced 3,691 lb. of Arabica coffee from the 1964 harvest which was sold for almost £473. Nearly all of this coffee was grown in the Ngorima T.T.L.

Of the ten coffee-producing units it is proposed to create in the Chipinga I.C.A., two have been established on the property Newcastle by the participants concerned. Two further participants have acquired their own land under the aegis of the Coffee Settlement Scheme, and a third prospective participant's case is currently under examination by the Department of Lands.

Potatoes

Satisfactory crops of potatoes were harvested from all three plantings, except in the case of the summer crop in the Gwelo group which suffered as a result of the drought. In the same area diminished water supplies made it possible to establish only 40 acres instead of a total of 150 acres in the case of the early and late irrigated crops. Five hundred and thirty-three acres of seed potatoes of both A and B categories were inspected and certified; this figure is very similar to that of the previous year and reveals that little expansion is taking place despite the fact that there is a need for more seed potato producers in the Eastern Districts.

Deciduous Fruit

Very good crops of peaches and plums were harvested in November and December in the Eastern Districts. There has been a marked increase in the planting of dessert peaches of the Culemborg and Rhodes varieties and of the newer early varieties of canning peaches such as Oom Sarel, Prof. Izak Malherbe, Prof. M. W. Black and Prof. Jan Neethling in the Rusape, Macheke and Marandellas areas as well as in the Eastern Districts. The extent of this development can be gauged from the fact that during the year about 15,000 (canning varieties) and 6,000 (dessert varieties) peach trees were planted out in the Rusape I.C.A. alone.

Citrus

Major expansion in the scale of their operations has taken place on Mazoe Citrus Estate in the Mazoe Valley and on Hippo Valley Estates in the Victoria lowveld. In the case of the former, 230,000 citrus trees have now been planted, of which 100,000 are in bearing. The target of this company, the main line of activity of which is the production of orange juice and citrus oil concentrates for export, is to build up its total planting to an eventual figure of 450,000 trees. Hippo Valley Estates Ltd., during the 1964–65 season, produced 96,481 cases of citrus compared with 53,956 cases during 1963–64. It now has a total of 84,656 trees established, of which 48,147 are in bearing.

Small producers are being encouraged to concentrate on the production of naartjies and late season oranges such as Valencias.

Grape Production

Good crops of grapes were produced in 1964–65 and quality showed an encouraging improvement. Expansion of plantings has taken place in many different parts of the country—including Matabeleland, which now has its own representative on the Rhodesian Viticultural Association. This organization came into being in September and is national in scope.

Vegetable Production

In spite of the unfavourable nature of the 1964–65 season from a rainfall point of view, production of both summer and winter vegetables increased and the efficiency with which they were distributed improved.

FIELD TRIALS AND TEST DEMONSTRATION PLOTS

Field Trials in European Farming Areas

During the 1964–65 season 56 critical cropping trials (excluding tobacco) were carried out on European-owned farms by the staff of this department in co-operation with the Department of Research and Specialist Services and, in the case of the maize/liming trials, with the Agricultural Research Council. (See Appendix IX.)

Test Demonstration Plots in African Areas

During the 1964–65 season there were, in all, no less than 3,049 acres established to various crops in the form of test demonstrations in African Purchase Areas and Tribal Trust land. Of this figure 1,674 acres (55 per cent.) were down to maize, 641 (21 per cent.) to groundnuts, 413 (14 per cent.) to grain sorghum and 50 (2 per cent.) to rapoko. The balance of the acreage embraced crops such as cotton, beans, bullrush millet, sweet potatoes, sunflowers and soya beans.

Full details relating to these test demonstration plots are contained in Appendix X, Table 2.

PEST AND WEED INSPECTORATE

Inspections

During the year 4,032 inspections were made in terms of the Plant Pests and Diseases and Noxious Weed Acts; of this figure 3,385 were concerned with visits to tobacco farms and tobacco premises for the purpose of implementing regulations promulgated under the former legislation. In addition, the tobacco tranship sheds at Beira were inspected monthly by the Senior Pest and Weed Officer or his deputy on behalf of the Tobacco Trade Association.

Prosecutions

Six prosecutions were made of farmers who had failed to comply with the requirements of the Plant Pests and Diseases (Tobacco) Regulations and fines were imposed in each of these cases. One farmer was prosecuted and fined for failing to destroy cotton plants by the 1st October. Due to legal technicalities or because the defendants could not be traced, court proceedings were withdrawn by the police in two instances.

Separate and distinct were a number of minor contraventions which concerned, in the main, failure to clean all tobacco buildings thoroughly and to destroy tobacco plants after the due date laid down by law.

Noxious Weeds

Small infestations of *Eichornia crassipes* were found to be present in the Umwindsi River bordering on the Highlands T.M.B. area and in a small stream on the farm Mountlavina in the Beatrice I.C.A. Of the other known places of infestation the Mangula Dam is the only one where a large number of Water Hyacinth plants are established. Steps are being taken to press the landowners concerned to clear these plants before flowering takes place.

A number of local authorities have introduced by-laws relating to the control of *Lantana Camara* but in the case of others nothing is being done to eradicate this noxious weed. The proposed alterations to the Noxious Weed Act which have now been drafted will, if enacted as legislation, help very much to control the spread of *Lantana* in towns and villages.

Twelve trials embracing the use of herbicides were carried out during the year and as a result of these, two leaflets entitled "Chemical Control of Lopholaena coriifolia" and "Latest Notes on Lantana Control" were prepared and distributed. The section has built up a considerable library of information on weed control and is now able to advise on most problems involving the use of herbicides.

General

The Inspectorate embraces both European and African areas in its sphere of operations but, because of the need to conserve mileage, it went into Tribal Trust lands and African Purchase Areas only when specifically requested to do so by provincial conservation and extension officers.

Tobacco

GENERAL

Staff

The Tobacco Branch is now fully staffed for the first time since the break-up of the Federation and there are now 63 trained tobacco advisory officers in the department, showing a gain of 14 trained officers over the 1963–64 season. Six trained officers resigned during the year. There has been a distinct improvement in the distribution of tobacco-trained staff, but the activities of the tobacco advisory service have been curtailed by the following factors:

(a) An increase in the area covered by trained officers.

(b) Reductions in mileage and subsistence allowances.

This has resulted in officers spending less time on tobacco advisory work. Consequently, recently trained officers are taking much longer to gain the experience so vital to the industry and the department is perturbed at the reduced percentage of time spent on tobacco by trained officers.

Training

During the year under review 20 officers were trained in tobacco. At present a further 20 officers are undergoing tobacco training. The training of 20 officers per annum is likely to improve the position in the field considerably over the next few years.

Five African extension assistants were trained by the Tobacco Research Board in burley and oriental tobacco at their Trelawney Research Station during the season. A further six are undergoing this training at present.

Burley and oriental courses were organized for farmers at the university. Some 35 farmers attended these courses.

The Tobacco Training Centre at Domboshawa that was established last year is now functioning well.

Tobacco Research Board

Liaison with Tobacco Research Board has been maintained. Officers from the Tobacco Branch again attended the Board's Annual Planning Conferences on flue-cured, burley and oriental tobacco.

The Tobacco Branch organized and attended the Board's annual lecture tours to the districts.

Trained staff again regularly visited the Board's stations during the season, and thus maintained close contact with the work in progress. A staff conference was attended by all trained officers at which Research workers from the Board presented details of work in progress and important results obtained.

The department is greatly indebted to the Board for providing lectures for in-service training of staff and at farmers' short courses.

Field Trials

The following off-station trials were run in conjunction with the Board on farms:

Flue-cured tobacco		
Spacing and Nitrogen trial	2	Mashonaland North.
Spacing and Nitrogen trial	1	Mashonaland South.
Burley tobacco		
Spacing and Nitrogen trial	1	Henderson Research Station.
Spacing and Nitrogen trial	1	Selous I.C.A.
Time of Planting trial	1	Victoria Province.
Oriental tobacco		
Variety trial	1	Matabeleland.
Fumigation and Rates of N	1	Matabeleland.
Spacing trial	1	Matabeleland.
TOTAL	9	

The Chief Tobacco Officer and other tobacco specialists have kept in close touch with the various organizations such as the Rhodesian Tobacco Association, the Rhodesian Tobacco Marketing Board, the Tobacco Export Promotion Council, the Tobacco Trade Associations, the Oriental and Burley Tobacco Growers Associations and all other bodies and committees connected with the Tobacco Industry. This close liaison between the field officers and farming and commercial concerns is of the utmost importance to ensure that advice and guidance to the growers will be on an agreed basis in line with the policy of Government and the industry as such.

THE TOBACCO CROP: 1964–65

Flue-cured Tobacco

Seedbeds.—Seedbed management was generally good in the main tobacco areas, but on many farms management and hygiene could be improved.

In certain areas shortage of water affected beds and drying winds were responsible for unevenness of growth. In many cases seeding rates could be reduced.

There was little trouble from either pests or diseases.

Land Selection.—Most farmers are fully aware of the importance of good land selection. Second-year tobacco is still gaining in popularity, due to the prices it receives.

Land preparation is improving and attention is being paid to depth of ploughing. There appears to be a swing to early ploughing in order to assist land preparation.

The use of grass in the tobacco rotation is not making the progress it should, this may be due to a decline in the returns from tobacco.

In an effort to produce on-type tobacco some odd rotations are being practised by farmers against the advice of the Research Board.

Use of Fertilizer.—In the vast majority of cases the use of fertilizer seems to be of the correct order. T.R.B. recommendations, Chemistry Branch recommendations and fertilizer company agronomist advice is being followed.

More attention is being paid to liming, but lime could still be applied with advantage to many soils for tobacco production.

With the heavy December rains top-dressing with nitrogen was very popular and in general nitrogen applications are becoming higher.

Crop Management.—Very few farmers practised extreme cultural techniques in order to produce on-type tobacco, but devoted attention to better cultivation and construction of bigger ridges for improved production. Unfortunately not all second-year and reverted lands are fumigated against eelworm and the crop suffered accordingly.

With the reduced acreages most farmers were able to handle their crop. There was a slight tendency to top on the high side. Suckers were kept well under control in most cases and suckeride was not used to any great extent.

Reaping.—This last season reaping presented very few problems and very little tobacco was lost. The Kurt tying machine is becoming increasingly popular, especially with the elimination of the use of the tobacco stick. About 35 per cent. of the crop is tied on to strings without using sticks.

Curing.—Last season there was a marked swing to horizontal string hanging, mainly at the expense of sticks. The use of vertical string hanging remained static.

In the Sinoia, Karoi and Banket areas the initial curings gave much black tobacco, but later reapings cured well. For the remainder of the country the primings and lugs presented no curing problems, but with the cutting off of the rains the tobacco became thick, more difficult to cure and produced considerable quantities of slate. The response to the T.R.B. talks on curing was variable.

Barns.—Building of additional barns is taking place only in the northern areas where an interest is being shown in long low barns. Elsewhere only improvements in handling facilities are being made.

Grower Numbers.—The number of growers is increasing in the northern areas and decreasing in the rest of the country.

Work Study.—Considerable interest is being shown in grading, which is the easiest operation for applying work study methods. Increasing numbers of farmers bulked and rough-baled their tobacco on the string and subsequently graded off the string.

Work study methods in other operations are applied in varying degrees and no doubt will be applied more and more as a means for reducing costs.

Grading and Presentation.—Grading standards and presentation, together with grading shed layouts are good, but there is definite room for all round improvement. One of the commonest faults is too fine grading, making more grades than is necessary. Grading belts were an innovation this year in the Banket area on quite a considerable scale and were quite successful.

Pests and Diseases.—Cutworm was by far the most serious pest. Leaf miner and budworm damage also occurred.

White mould was the commonest disease and even then it was of very little consequence. Bushy top was practically non-existent. There was an increase in the practice of fumigation, most second-year lands are fumigated while most virgin lands are not fumigated.

General.—High veld growers were more satisfied with the prices they have received this year and many feel that their best policy is to increase yields per acre. Growers from the warmer quicker-growing areas were dissatisfied with their tobacco prices.

GENERAL CROP STATISTICS

Number of Growers	2,645
Estimated total acreage planted	209,716 acres
Average acreage per grower	79·5 acres.
Average crop per grower	87,900 lb.
Average yield per acre	1,106 lb.
Weight sold	232,756,109 lb.
Average price per lb.	32·97d.

Oriental Tobacco

The crop is produced mainly in the low rainfall areas which this last season suffered severely as a result of the limited rains, resulting in a poor crop. Late plantings never grew out and the early onset of cold weather made curing doubly difficult.

Seedbeds.—In the European areas, seedbed management was generally of a fairly high standard, but in the African areas management could be greatly improved. Water for seedbeds in African areas always remains a problem, and success with beds depends upon the availability of water during the critical period.

Lands.—Land selection and preparation are appreciated by most European growers, with mostly virgin land being used.

In African areas a great deal of virgin soil in grazing areas is used but old lands are used where virgin land is not available.

In the low rainfall areas it is important that lands be early ploughed in January as there is no doubt that this gives a far more even crop. Late-ploughed land is still used, particularly in African areas.

Fertilizer applications are based mainly on Tobacco Research Board recommendations, with banding becoming more popular. Many fertilizer applications are based on soil samples sent to Chemistry, but in most areas the crop has been grown long enough for fertilizer applications to be based on experience.

Planting Out.—The majority of the Matabeleland crop is planted out with water containing Aldrin or Dieldrin. This practice is common elsewhere but not to the same high degree.

There is a tendency toward the single ridge double row method in all oriental areas.

Crop Management.—Plant populations and stands were generally good in European areas, but not so consistently in African areas. The more experienced growers in all areas appreciate the importance of high plant populations.

Reaping.—It was a most difficult season for reaping as the leaf did not ripen uniformly due to the dry, hot weather conditions prevailing. Because of scorching, leaf had to be reaped although still immature and this gave rise to the high percentage of Kappa grades on sale this year.

Growers in all areas, must ensure that every leaf is reaped and cured as this is the chief way of ensuring high yields. Reaping of leaf before it is over-ripe is also important to obtain quality.

Curing.—From January onwards difficult curing conditions were encountered. Curing in the main is done on portable racks. Curing systems are receiving greater attention from many European farmers, and it is a delight to see the innovations that some have evolved. These farmers are complete converts and will always form the backbone of the industry.

There is still a tendency in all areas to over-expose the tobacco during curing. The tobacco must be removed once the web of the leaf and the major part of the midrib is dried, and put into storage. To wait until the odd mid-rib is completely dry means that most of the leaves already cured out, tend to be dehydrated with consequent loss in quality.

Grading and Presentation.—Storage and baling facilities could generally be improved upon. A number of bales were rejected for mould and had to be re-handled. On the other hand, many bales were down-graded because the leaf was dry and shattery. This was due to two reasons:

(a) Farmer nervousness of over-conditioning the crop.

(b) The type of leaf produced this year due to the drought.

More tobacco should be stored in the bale, because in these circumstances it improves in quality, aroma and appearance. The alternative in storage would be to store in bulks, but here management must be of a high order if the tobacco is not to be spoiled.

The problem with the African crop is that it is individually small and split bales must be used to ensure that grades are not mixed.

Pests and Diseases.—The main pests were leaf miner, budworm and cutworm. These, however, are easily controlled with D.D.T. Eelworm is an ever present factor particularly in African areas and can reduce crops drastically. The use of fumigation is however, fairly widespread in European areas and is extending into African areas.

Copper "disease" was again present this year and the Tobacco Research Board are working on this problem.

General.—The past season has been the most difficult one experienced so far, and it is a credit to growers that they managed to produce a crop under such conditions. Some growers have dropped out and others, particularly in Mashonaland, have come in, thus an increase can be expected this season. An increase in the number of African growers is reported, particularly from the Victoria and Midlands provinces.

Sales.—Sales up to the 30th September, 1965, were as follows:

	Samsun lb.	Selouk lb.	Total lb.	Average price pence per lb.
Europeans	312,282	1,121,712	1,433,994	28·28
African	236,352	15,941	252,293	27·99
Total	548,634	1,137,653	1,686,287	28·24
Average price	27·76	28·47	28·24	—

It can be seen from the above that Selouk formed 67.5 per cent. of the crop sold and Samsun 32.5 per cent. This could well change for the 1965–66 season as many growers are intending to produce Samsun, particularly in the Mashonaland areas.

ESTIMATED ACREAGES 1964–65 SEASON

	Acreage
Matabeleland	1,329
Midlands	780
Victoria	795
Mashonaland North	73
Mashonaland South	103
Manicaland	83
	3,163

This therefore gives an average of ±560 lb. weight of tobacco sold per acre.

Burley Tobacco

Seedbeds.—In the African areas management was very poor, especially watering, and insect damage was also severe. In the European areas management was good with growers who had previous flue-cured experience, but with new growers management, especially watering, left much to be desired.

Land Selection and Preparation.—On any particular holding the heaviest soils possible were selected. In African areas mostly virgin land was used whilst in European areas much Burley followed maize. Land preparation and ridging was still far below standard in most African areas.

Crop Management.—Fertilizer applications generally followed T.R.B. recommendations and planting out was fair but in some cases the plant population was too low. Topping tended to be on the higher side and more attention could have been paid to suckering. Primings were lost in some areas due to a reluctance to start reaping.

Reaping and Curing.—More leaf was reaped this season while waiting for the tip of the plant to get riper before stalk cutting. Where labour was plentiful leaf reaping the whole plant was popular and according to the growers concerned this was successful. Spearing on to sticks is becoming more popular than hanging on wires or tying on string, and in some areas wilting on the sticks prior to barn packing is becoming popular.

Barn packing rates were higher than normal in an effort to increase barn humidities. Curing was better in barns that could be closed and also better in bigger barns. In the lowveld the large amount of varigated leaf was due to very low humidities during curing. There were crop losses due to insufficient barn accommodation.

Barns.—New barns are being constructed in areas where burley tobacco sold well. If the coming season is more favourable barn accommodation will be insufficient and a fair amount of tobacco might be lost.

Grower Numbers.—There appears to be about an 8 per cent. reduction in the number of European burley growers for this coming season compared with last season, but an increase of about 15 per cent. in acreage. There is an increase of about 40 per cent. in the number of African growers and an increase of 120 per cent. in the acreage to be grown by them this coming season.

Pests and Diseases.—Leaf miner appeared to be the main pest. Cutworm and budworm damage was also reported.

Grading and Presentation.—Due to difficulties in conditioning tobacco there were higher grading losses. Grading and presentation, especially from African growers, left very much to be desired.

General.—There was much dissatisfaction with prices, but the low prices were mainly attributed to poor quality tobacco as a result of the dry weather. Open grained fluffy tobacco which did not suffer from drought, sold well.

General Crop Statistics

Number of growers	African	443
	European	397
	Total	840
Estimated acreage planted	African	491 acres.
	European	4,982 acres.
	Total	5,473 acres.
Average acreage per grower	African	1·1
	European	12·7
	All growers	6·5
Average crop per grower	African	1,130 lb.
	European	12,800 lb.
	All growers	6,650 lb.
Average yield per acre	African	1,020 lb.
	European	1,020 lb.
	All growers	1,020 lb.
Weight sold	African	500,000 lb.
	European	5,089,968 lb.
	Total	5,589,968 lb.
Average price per lb.		22·16 d.

Irrigation

Weather Conditions and Water Supplies

The 1964–65 season was again one of poor and erratic rainfall. This led to most rivers in the lowveld tending to dry up earlier than usual, bringing about later summer plantings than was desirable.

On the other hand, particularly in the medium and highveld areas, this led to an even greater emphasis being placed on irrigation by the farming community. The summer supplementary irrigation of cotton and maize, and the winter irrigation of wheat, became increasingly popular.

The following table, for which there are unfortunately no reliable figures available for the two Mashonaland provinces, gives an indication of the tremendously increased activity in irrigation throughout the country. It reflects an overall increase of the acreage under irrigation by 26 per cent. on the 1964 figures.

Province	*Acreage under irrigation*		*Nett increase*
	1964	*1965*	
Manicaland	16,260	18,235	1,975
Victoria	50,150	63,550	13,400
Midlands	1,572	2,956	1,384
Matabeleland	2,670	6,508	3,838
Mashonaland (North)	12,390	14,190*	1,800*
Mashonaland (South)	4,230	5,630*	1,400*
Total	87,272	111,069	22,797

*Estimates only.

Irrigation Training

In order to meet the increased demands for advice and assistance in the layout and design of farm scale schemes it has been necessary to increase the tempo of in-service training.

In previous years in-service training on the National Training Programme has been confined to one course of a fortnight's duration per annum, attended by an average of 20 extension officers. During 1965 three separate courses, each of eleven days' duration, were held in Salisbury, Bulawayo and Fort Victoria, with approximately 20 participants on each course. It was gratifying to see that several provincial as well as group officers voluntarily attended these courses. Enrolments for similar courses to be held in 1966 already total more than 80 group and extension officers.

The irrigation specialists also assisted the Natural Resources Board in the running of a four-day course in practical irrigation for farmers held at the University College of Rhodesia and Nyasaland. This was attended by 93 young farmers, managers and assistants, and from all accounts proved to be both popular and successful.

The specialists also undertook the lecturing on irrigation for second-year students of Gwebi Agricultural College. Two lectures were given to Chibero College students and numerous lectures were given by request at I.C.A. field days and meetings.

Irrigation Extension and Development in Farming Areas

Victoria Province

In the lowveld, development continued with a further 12,900 acres being planted to sugar-cane, 400 acres to cotton and 100 to citrus.

On the Hippo Valley Estates Settler Scheme a further 22 settlers have taken occupation of their farms. This virtually absorbed the full working time of one extension officer assisted frequently by provincial staff.

The unforeseen slump in world sugar prices is causing hardship to the 13 new settlers who took occupation last year. Those committed to sprinkler systems of irrigation are finding it very difficult to repay the capital cost of the equipment and at the same time to meet the high operational costs involved. Owing to the topography of the land and the texture of the soils, the majority of these settlers had no option in the method of irrigation to be followed.

Four and a half cusecs from Lake Kyle have been made available (on a temporary basis) to farmers riparian to the lake. Investigations into the use of this water is presently taking place and there is no doubt that this will bring greater stability to the area. One farmer is busy planting a 300-acre scheme on water pumped from the lake.

The Manjirenji canal is complete and the dam is nearing completion, but the position regarding the Nandi Sugar Estates is still uncertain. Some 6,000 acres have been cleared, but to date only 900 acres of seed cane have been planted. In view of the uncertainty of sugar markets, the possibility of turning Nandi into a settler scheme producing cotton, maize, wheat and seed beans should not be overlooked.

This branch is represented on the Water and Lands Committee of the Sabi Limpopo Authority and is constantly called upon in the planning of the lowveld future.

Matabeleland Province

The second successive drought has stimulated interest in irrigation as is witnessed by the increased acreage from 2,670 to 6,508 acres during 1965.

As a result of Government's policy to make £3,000,000 available over the period 1965 to 1968 for water development in this province, the Matabeleland Development Council has been set up to advise Government on policy regarding the expenditure of this fund.

Construction has commenced on the Silalabukwe Dam on the Insiza River near West Nicholson. The purpose of this dam is threefold—to irrigate approximately 700 acres of alluvial soils, to make water available to mining and industrial concerns and to augment the flow of the river during the dry season for use by downstream cattle ranchers.

Detailed investigation of the Insiza Settlement Scheme near Fort Rixon has been completely documented and construction is likely to commence in the near future.

The following schemes are in the process of being investigated:

Mananda (1,400 acres)—Plumtree I.C.A.
Pollards (3,000 acres)—Inyati I.C.A. and T.T.L.
Inova (8,000 acres)—Bubi I.C.A. and Nkosikasi T.T.L.
Shashani.
Antelope.

The average of irrigated crops grown during the year under review were as follows:

Crop	*Shangani*	*Bulawayo*	*Wankie*	*Plumtree*	*Matobo*	*Gwanda*	*Total*
Tobacco	175	—	20	14	12	6	227
Maize	610	847	15	—	—	192	1,664
Groundnuts	100	—	—	—	—	—	100
Stockfeeds	428	26	—	80	—	—	534
Cotton	20	15	100	—	5	800	940
Wheat	12	230	18	—	—	22	282
Lucerne	269	876	100	—	30	30	1,305
Potatoes	98	40	—	—	—	60	198
Fruit and Flowers	63	644	100	—	—	245	1,258
Vegetables	206						
TOTAL							6,508

There is a tendency to swing towards summer supplementary irrigated crops, particularly towards cotton in the Beit Bridge area where the potential yield is between 4,000 and 5,000 lb. to the acre. Farmers in this area are marketing their cotton in the Republic where a much more favourable price structure and grading system exists.

Midlands Province

The expected expansion of irrigated (summer supplementary and winter) acreage of some 1,000 acres reported last year was well founded, as in fact the increase was from 1,572 acres to 2,956 acres—an increase of 1,384 acres.

Details of expansion are as follows:

Lucerne	148 acres to 161 acres.
Wheat	200 acres to 305 acres.
Citrus	74 acres to 80 acres.
Vegetables	Static on 144 acres.
Cotton	205 acres to 520 acres.
Tobacco	Static at 90 acres.
Maize	631 acres to 1576 acres.
Potatoes	Static at 80 acres.

In all instances, marked improvement in yield were recorded against dry-land crops which suffered severely from drought.

Many major schemes are being investigated by field officers in close collaboration with the Ministries concerned. To mention but a few, at present receiving the highest priority (established by the Midlands Provincial Co-ordinating Committee) are the Umtebekwe Scheme with a possible potential of 4,000 acres from a multi-purpose storage work still to be built, and the Manesi Hills project on the Umniati River with a potential 5,000–6,000 acres of irrigation from a storage work considered "economic" still to be built.

Throughout the province, officers are carrying out preliminary investigation on some 18 schemes.

Mashonaland South Province

Interest remains high, and many farmers have established schemes, mostly relying on sprinklers, usually with summer supplementary irrigation as the main object, but using the equipment for winter irrigation as well.

Marandellas and Macheke have about 4,000 acres under irrigation which has largely come about in the past five to seven years. Several of these farmers have planted fairly large acreages to winter wheat and have obtained yields of between 15 and 20 bags to the acre.

Irrigated Virginia tobacco is successfully grown by several farmers in the area, and a close watch will be kept on this season's crop in conjunction with officers of the Tobacco Research Board in order that we may learn more about tobacco under irrigation—our present knowledge being extremely limited.

A preliminary investigation was done on the potentially large Umfuli-Mondoro Settlement Scheme. Unfortunately, owing to the limitation of storage and the length of canals involved, the scheme will be an expensive one. The cost of water for the various schemes put forward varies between £7 and £10 per acre foot. This considerably reduced the chances the scheme has of competing with schemes in other provinces for Government financial assistance.

Mashonaland North Province

Considerable interest is being shown in this province in the summer supplementary irrigation of maize and cotton and also in winter irrigated wheat, and excellent yields of all three crops have been obtained.

The number of outstanding applications for water rights indicates that a very substantial increase in irrigation is likely to take place in 1966.

One major scheme, the Wengi Scheme in the Glendale area, was fully investigated during the year and reached the stage of receiving Treasury approval. Owing to the scarcity of capital its implementation has been temporarily postponed.

Negotiations are under way to commence a pilot project in 1966 whereby a 120-acre irrigation plot will be farmed in a similar manner to the 120-acre plots suggested in the Wengi Report. From this we will obtain much useful information, such as the managability and economics of a typical holding, together with data concerning the suitability of the cropping programme and farming calendar most suitable for large-scale settlement in the Mashonaland Region.

A preliminary investigation into the Shamva-Bindura scheme was undertaken. It looks to be a very worthwhile project but, as the local farming community are opposed to relinquishing portions of their farms to a Government Settlement Scheme, further investigation by Government had to be dropped. The local I.C.A. are presently exploring the possibility of private commercial funds to implement the scheme.

Manicaland Province

A tremendous increase in irrigation has taken place in this province as is shown by the following figures:

	Summer supplementary	*Permanent Irrigation*
European farms	2,592 acres	9,990 acres
Purchase Areas	61 acres	86 acres
	2,653 acres	10,076 acres

Irrigation surveys for potential schemes and assessments of suitable soils were carried out in conjunction with the Department of Water Development in the Rusape and Inyanga areas and for coffee and tea production in the Chipinga and Vumba areas, also in the Gudyanga area for a proposed African Irrigation Scheme.

It is especially gratifying that management practices have steadily improved. Farmers are being much more selective in obtaining advice for the correct method of irrigation for their conditions and sprinkler, flood and corrugation (or trickle flow systems) are all finding their place. The corrugation system in particular has proved of great value in improving irrigation efficiency and reducing labour costs on the heavier-textured soils which were previously inefficiently flooded. Land selection for irrigation is getting the attention it deserves while land smoothing by means of planes, and cultural practices, such as fertilizer use and correct frequency of irrigation, are receiving more attention and proving their value in higher crop yields. A start has been made in the scheduling of irrigation by means of evaporation pans and interest in this aspect is growing.

Irrigated Crops

Wheat.—Winter wheat has increased in acreage remarkably and yields range from 12 to 19 bags per acre. Rust showed up in the Mazoe variety seriously but somewhat too late to affect yields badly. Wheat is not only an extremely economical crop being low in water and labour demands but can also play an essential part in this area in rotations due to the danger of an eel-worm build-up with the increased production of horticultural crops for the canning factory.

Cotton.—Yields and prices of the small trial crops put down by farmers were so encouraging that a large acreage will be planted next season. The bulk of the irrigated crop is being put down under the corrugation system.

Deciduous Fruit.—There is a great increase in interest in stone fruits and a further 26,000 trees were planted in Rusape alone this season. A "break through" in the acceptance of the absolute necessity of frequent irrigation has occurred and demands for advice on water requirements and the scheduling of irrigation by means of evaporation pans is growing. Indications from investigations on a few of the larger orchards this year is clearly showing that infrequent irrigation and small basin sizes are a direct cause of small size fruit whilst conversely the regular irrigation of the full root area of the tree increases fruit size and quality to the point where an estimated 70 per cent. of the early Culemborg variety of peaches will be of export quality.

Green Peas.—Two thousand three hundred tons were delivered to the factory at an average yield of 2.3 tons per acre. Quality was excellent. Trials conducted by SunRho showed that high seeding rates of over 160 lb./acre and frequent irrigation gave yields of over 6.5 tons/acre. By using different varieties the harvesting period can be extended to the advantage of both the grower and the factory.

Green Beans.—The factory received its full requirement for the season, after which contracts were not renewed due to the decline in world markets. Firm orders have again been received from overseas, however, and contracts for 1,000 tons for April-May delivery will be issued.

Brassicas.—Total delivery to the factory met less than half the requirements but this was mainly due to lack of sufficient irrigation by one of the largest growers. The position has since been corrected. Ninety tons of cauliflower was produced.

Sweetcorn.—Not sufficient planning was made by growers for supplementary irrigation and a drought at the tasselling stage reduced yields.

Onions.—Markets were generally oversupplied but Burma Valley farmers received good yields and prices for their earlier crops.

IRRIGATION EXTENSION AND DEVELOPMENT IN TRIBAL TRUST LAND

A change in policy of operation and maintenance of Tribal Trust irrigation schemes was brought about from July. This department had previously been directly responsible for the complete operation and maintenance of these schemes, other than the mechanical maintenance of the pumping plants, but as from July the Ministry of Water Development has taken over responsibility for all operation and maintenance involved in getting the water supply to "field edge". Conex is responsible for the management of all farming

operations "beyond field edge", including water reticulation, the maintenance of lateral canals, drainage systems and flood protection works.

It is early yet to comment on the effect of this change in policy, but to date it is working extremely well due to the close liaison between the two Ministries concerned.

Marketing is being undertaken by local co-operative societies which exist on all Manicaland schemes and will be introduced into Matabeleland as soon as thought opportune.

Manicaland Province

The 1964–65 season started badly as water supplies were extremely low in all rivers. The Sabi River at Chibuwe dried up completely in October and the Tanganda River fell to an extremely low level in both October and February. The Devuli, which had been dry since the previous March, resumed flow in November, but winter irrigation was again not possible as flow ceased entirely in April.

Due to the late planting of summer crops and limited funds available for maintenance and construction, credit must be given to all agricultural staff for the manner in which acreages were adhered to, construction and repairs carried out and water distribution ensured under extremely adverse conditions.

The possibility of increasing the acreages of schemes on a purely summer supplementary basis was looked into, but for various reasons the idea has had to be abandoned. In most cases, either there was insufficient suitable land available or else extra pumping plants would have to be installed. Any funds which might be available for additional pumping plants would best be spent on the numerous sites available for year round irrigation.

One such site, Gudyanga, which is six miles upstream from Birchenough Bridge, is at present being investigated. Approximately 400 acres of Class A alluvial soil exist which could be supplied by pumping from the Sabi River at a very reasonable cost.

Irrigated acreages on all but one of the schemes has remained static. The one exception being Nyamaropa, which now has nearly 900 of the potential 1,700 acres ready for this summer's cropping. In spite of its initial political set back this scheme is rapidly being developed and for most crops it tops the production figures in average yields per acre.

The 50 acre sprinkler pilot scheme at Chibuwe, after ten years of operation, is being converted to a surface irrigation scheme. The equipment stood up well until the last year or two, but the plotholders became more and more lethargic in their outlook and yields continued to drop. The lesson learned here is that heavily subsidized sprinkler schemes are unsuitable for African settlement, the average plotholder's outlook being that once he had planted his crop all that is required is the periodic movement of spray lines —for the rest it is fair competition between crops, weeds, birds, insects and disease until the crop is ready for harvest.

There is room for improvement on all schemes as regards irrigation efficiency and this factor really depends on improved distribution through canal-lining, land-levelling, earth canal cleaning and stricter control of water allocation. To a large extent more community and individual effort will be required by the farmers themselves, but it must be remembered that most of these schemes have been in existence for many years, and were not provided with the most efficient distribution systems originally. Large sums of money are being spent in the country in bringing into being new African irrigation schemes, where even subsidiary canals are lined from the inception of the scheme. Many of the existing Manicaland schemes can be brought to a high standard of efficiency provided that funds are made available for this work.

Serious drainage problems exist on the Nyamaropa and Mutema schemes. It is hoped that the allocation of funds for drainage works will be given high priority on a national basis for next year's programme.

Crops.—Details of crops grown and yields obtained for individual schemes are shown in Appendix X. A general observation on crops is as follows:

Maize.—There was an increase in the maize acreage and a slight drop in yield due to late planting and water stress occasioned by poor water supplies and the difficulty in completing irrigation cycles sufficiently frequently during hot, dry spells.

All-the-year-round-planting of maize for sale as green mealies is resulting in an increase of streak, stalk borer and a carry-over of American Bollworm.

Cotton.—Acreages increased from 625 to 978 acres. A total of 1,026.8 tons was produced at an average of 2,100 lb. per acre. This yield was obtained despite the late planting of the crop and the large number of new growers. A large percentage of growers averaged 4,000 lb. per acre and one Nyanyadzi grower obtained 5,365 lb./acre.

Burley Tobacco.—Despite the increase in acreage from 11 to 45.25 and the lamentable lack of barn space, a total of 67,201 lb. at an average of 1,485 lb. to the acre was produced.

Seed Beans.—A total of 952 acres were grown, giving an average of 5 bags per acre. The once unpopular white varieties are giving satisfactory returns. The high price paid for sugar beans, the extra cleaning required and delays in final payment until after germination tests are completed with seed beans might seriously decrease seed bean acreages next year.

Seed Peas.—A limited demand for this crop resulted in 70 acres being grown giving an average yield of 9.5 bags (112 lb.).

Seed Tomato and Seed Lettuce.—There was a greatly reduced demand for these crops by the seed houses. One hundred and thirty eight acres for lettuce and 43 for tomato seed were available for planting but seed houses only took up 62.5 and 22 acres respectively. Quality is expected to be of the usual high standard obtained with these crops.

Matabeleland Province

The following new T.T.L. schemes have been completed or are nearing completion and will be ready for 1965 summer plantings:

Shashi Extension	200 acres
Bili	80 acres
Rustlers' Gorge	100 acres
Kongoni	80 acres
Mzinyatini	150 acres
Tshongokwe	40 acres

Water is being obtained from sand abstraction for the first four of the above schemes and some difficulty is being encountered in obtaining the flow required. Modification of well points will be required in all cases.

Construction on the Makwe (750 acre) scheme is proceeding according to schedule and settlement should be possible for the 1966 winter season.

Construction has also commenced on the Chikwarakwara scheme in the Beit Bridge district. The scheme will be completed in 1966.

Tenders have been called for the construction of the 1,200 acre Ingwezi scheme in the Plumtree district but it is unlikely that construction will start before the end of the rains.

Investigations are in progress on numerous small (20 to 100 acre) schemes and the 1,200-acre Ntabasnyoni scheme. These, if suitable, will be financed from the £3,000,000 mentioned earlier in this report.

Yields and acreages of crops grown on the original portion of Shashi and on Zinapi are included in Appendix X.

Animal Husbandry

Staff

Severe staff difficulties were experienced during the year, and by the end of the year only one of the specialist extension posts was filled. Fortunately arrangements are in hand for the filling of the vacancies and the demand for assistance is rapidly increasing due to the interest in beef production.

Staff Training

In spite of the serious staff position, the programme of in-service and induction training courses was completed. To achieve this it was necessary to rely heavily upon the services of the animal husbandry officers of the Department of Research and Specialist Services, who gave unstintingly of their time and without whom the animal husbandry training programme would have broken down completely.

The main emphasis of the courses was on beef production. In addition, a national dairying course and courses on sheep production were held.

Field staff were also kept informed of recent developments in the Animal Husbandry field by the issue of ten advisory notes or circulars and twelve technical reprints culled largely from journals of limited circulation.

Field Days, Discussion Groups and Demonstrations

Animal husbandry officers attended and lectured at 55 of these functions. Figures for attendance were not recorded. The number of functions attended decreased during the year due to the shortage of specialist officers. The number of individual farm advisory visits paid were also low.

Field Trials and Test Demonstrations

The impact of test demonstrations on farmers in the Tribal areas is continuing, and numerous demonstrations were carried out in the field. Victoria Province reports enthusiasm and a highly satisfactory response to the demonstration of pen feeding and improved management practices.

Livestock Improvement Scheme

Details of livestock importations are given in Appendix IV.

The Beef Recording Scheme continued in its operation. There appears to have been some falling off in enthusiasm for beef recording. This is attributable in part to staff changes and transfers, which have adversely affected the rapport built up between farmers and extension staff over the years.

General Livestock Information

Beef Cattle

Climatic Conditions.—The effect of the drought has been nation-wide. In all but the northern most provinces, emergency measures have been necessary to preserve the cattle population. Some desirable effects have been noted however. The movement of cattle to Mashonaland has helped to build up stock numbers in that understocked area. In the areas where the effects of drought have been more serious, the practice of supplementation of natural grazing has spread very widely. This improvement in management has been so sudden as to lead to a shortage of protein-rich stockfeed.

The extent to which winter supplementation enforced by climatic conditions is considered by producers to be suitable for subsequent years of higher rainfall remains to be seen.

Interest in Beef Production.—In conformity with Government policy, the importance of beef production was kept well to the fore through field days, discussion groups and individual visits. There is a very definite increase in interest in beef production, particularly in the higher rainfall parts of the country and in many areas the farmers have formed stock owners' associations and have organized weaner-feeder sales.

Several factors have contributed to increased interest in beef production and among these are development in feeding techniques, fencing rebates, price structure improvements and perhaps the greatest of all the current situation in the Virginia tobacco field where profit margins are narrowing and some uncertainty exists.

Recommended practices such as supplementary feeding, timely weaning and other general practices are becoming routine but often the advantages are lost through not having a set policy of production, frequently changing from one form of production to another before the benefits of improved practices can be realized. There are still too many who are under the impression that supplementary feeding is the sole answer to their problems and this often masks the effect of poor veld management. Veld management and grazing control are not widely practised and the maximum summer weight gains are not being achieved as a result of this.

The wave of enthusiasm for "high energy feeding" has been the most remarkable recent development in beef production. An estimated 25,000 head of cattle were fed in this manner, many by individuals with no previous experience of fattening cattle. As a result the supply of $2\frac{1}{2}$–$3\frac{1}{2}$ year old feeders for next year's fattening programme has already been utilized to a large extent and the prices which will be paid for feeder cattle in the future are a matter for conjecture.

In the African areas there is evidence of a greater interest in livestock production, particularly in the feeding and selling of cattle direct to the Cold Storage Commission. In this connexion a real "break through" has been established in the Fort Victoria Province where in 1963 only 13 head were fattened and sold direct to the Commission whereas during 1965 some 800 head will be fattened and sold to the Cold Storage Commission.

In the Nyazwidzi Purchase Area only about a dozen head were fed in 1964 as a demonstration and this has led to such wide-spread interest that some 300 head will be pen fattened by the end of this year.

The simplicity of this system of feeding by using mainly crop residues with some purchased protein supplement has resulted in it being accepted widely in the Fort Victoria Province and is also spreading to other African areas in the country. As a result of this important work a higher percentage "take off" will probably develop in the African areas which will be of great national importance.

Breeding.—The national breeding herd has once again failed to increase at a rate commensurate with the increase in slaughterings. However, the difficulty in obtaining suitable store cattle has prompted several large-scale feeders to establish breeding herds.

The interest in exotic bulls has continued this year. In spite of the increase in the number of pedigree herds high prices for bulls were maintained, and as the local supply was not adequate to meet the demand for exotic bulls recourse was once again made to the South African market.

Dairying

Dairy farmers had a difficult year as a result of the drought. Economic pressures appear to be forcing an increase in the average size of dairy herds, the large herds expanding whilst small herds go out of production.

Sheep

The sheep population figure continues to rise. In small flocks the standard of management and efficiency of production is generally low, but in many larger flocks fat lamb production is being practised successfully. In African areas of Matabeleland, there is considerable interest in dosing as a means of improving production, while in Victoria Province supplementary feeding is gaining a foothold.

Pigs

Pig production dropped during the year. The causes of this appear to be the poorer grain crop last year and also, in some farming areas, apprehension as to the results of the proposed new grading system.

The difficulty in pig production extension in African areas is largely the physical one of co-ordinating the optimum weight of pigs produced in African areas with the erratic transport arrangements to obtain prices which fluctuate in a fashion not understood by the average producer. Africans now produce practically all the requirements of the local pork market and there is a steady increase in interest for this line of production by African farmers.

Beekeeping

General Progress.—The beekeeping industry has not yet geared itself to produce appreciably large quantities of honey and beeswax, surplus to local consumption requirements, which could be exported. Nevertheless, steady progress is being made by beekeepers in improving their techniques as a result of the work of the Apiculturist.

Beekeeping as a part-time occupation appeals to people in diverse walks of life and this past year witnessed an increase in the total number of members of the five beekeepers' associations as well as in the total number of hived colonies. The last mentioned figure, it is estimated, now stands at some 20,000. There are now over 1,000 beehouses in the country.

Basket hives based on the Greek Anastomo and Distomo pattern which the Apiculturist has had made by the basket workers in Seki township near Salisbury, have been widely distributed as a demonstration tool for the use of extension officers who have participated in in-service training couses in beekeeping. Indications are that they have made a favourable impression where they have been tried, but it is premature as yet, to assess the magnitude of the effect that they have had on traditional African methods of keeping bees.

Training.—In accordance with policy the Apiculturist continued to devote a substantial portion of her time to the in-service training of field staff in the principles and techniques of beekeeping. During the year three in-service training courses were held each of which was divided into four sessions of two days' duration. Twenty officers participated. Two groups of beginner beekeepers, seventeen persons in total, underwent very similar training, and one-day revision courses were also held for the benefit of officers who wished to brush up their knowledge of this subject.

Eighteen lectures on beekeeping were given to the students of Chibero Agricultural College and twelve to those under training at Gwebi.

Training

HEADQUARTERS

A very full schedule of training courses in the national programme has been provided at headquarters and serviced by Training Branch staff and other specialists. Other courses in the programme have been held at provincial venues but serviced in part by Training Branch staff and other specialists. (See Appendix V.)

The training provided at the courses in the national programme is designed to meet the needs of staff, as indicated by a survey of requirements. However, participation in these courses is open to other than officers of conservation and extension and it has been a pleasant feature of the year reviewed that other departments have shared our facilities and been welcome contributors to many of our training situations.

Obligatory induction courses had very full enrolments consequent upon the increased number of recruits entering the service in recent years. Of the other obligatory courses those dealing with training methods for specialists were well supported by branches and other departments.

A new venture for the branch was training in staff supervision. With the large junior staff it is apparent that their management presents some problems.

Three courses of two weeks each on Irrigation were held at Salisbury, Bulawayo and Fort Victoria. Each course was over-subscribed, indicating the importance currently associated with this subject.

A new series of courses on beekeeping was commenced during the year and, here again, this training attracts more volunteers than our facilities can accommodate.

The farm machinery courses held at Domboshawa have been much in demand and appreciated by trainees.

Public speaking courses were arranged at various Provincial headquarters, and well received.

Conservation conferences for African chiefs were arranged by the Natural Resources Board and serviced, primarily, by Training Branch. These conferences were, generally, acclaimed and established a favourable initial climate in which it may be possible to develop the conservation farming conscience in the Tribal Trust land.

Investigation has continued into finding a suitable method of teaching the vernacular languages, proficiency in which is an obvious asset to any extension officer. We have continued to sponsor officers attending the Language Laboratory course in Shona at the University College. Latterly, Training Branch has collaborated with Mr. Arthur Pendered, well known Shona linguist, in an experimental "crash" course in Chishona. Held at Domboshawa for 11 officers, first evaluation suggests that this has been the most successful language training with which we have been associated. This type of training and its evaluation continues.

It is necessary to record a less tangible function that has been performed by Training Branch. Consequent upon the reorientation that community development may imply for departments who have had little occasion to concern themselves with "working with people", it is now apparent that there is a lot of interest in this kind of work. Voluntary organizations as well as non-Government agencies and Government departments are seeking guidance in training and it may be that our experience in conservation and extension is unique in the field of non-directive training of adults, and the methods best suited to their situation. Currently there are many meetings that are concerned with training principles and it is believed that our contribution to these councils is much valued. Our opinions are frequently sought and it may be that we are having considerable influence on training patterns throughout the country, as a result of the high standard of effective training that has been associated with agriculture in Rhodesia.

The Chief and Senior Training Officers and the Training Instructor, Domboshawa, have played an important part in the preliminary investigations that are concerned with community development training. Good rapport has been established with those officers who are concerned with the training programmes of other departments.

At the beginning of 1965, 178 new extension assistants were accepted into the department, initially through the Training Branch at its institutes, before being posted to the various provinces. The acceptance of this large intake taxed the resources of both the trainers and the provinces, and was an organizational exercise of some magnitude that was satisfactorily completed.

Institute Programmes

Domboshawa

Tobacco and farm machinery training have been independently established at Domboshawa for some time and are reported upon elsewhere.

Training Branch began to operate Training Institute facilities in January, 1965. The programme has included extension assistant induction, conservation conferences for chiefs, extension methods courses and Shona language training. In addition, the instructor has assisted at courses administered by the Education Department staff at Domboshawa, "Mixed" courses in community development, school managers and home demonstrators' courses.

An interesting development at Domboshawa is its ripening association with neighbouring Chinamora Reserve. Chief Chinamora and his people are enthusiastically joining in extension and other training emanating from Domboshawa. Field days in the reserve and at Domboshawa farm are well supported. It is hoped that our institute facilities will be able to offer fuller service to the Chinamora community in 1966.

Alvord

Compared with the previous year course participants at Alvord have risen in number by more than 50 per cent. to 1,345. Dormitories have been occupied for 6,563 resident days and more than 20,000 meals served in the main dining-room. Sixty courses have been organized by or at the Institute and the staff and/or facilities of Alvord were used for district courses in both Victoria and Midlands.

Five hundred and fifty-two members of Conservation and Extension staff have received training at the institute this year. One-third of the training time was expended on the intake training of extension assistants. Seven courses were held for extension officers and 24 for extension assistants (but extension officers also attended most of this latter training).

The conservation conferences for chiefs were followed up by youth extension and extension refresher courses. Youth training has been shown to be very profitable extension. Victoria Province now has 26 newly formed young farmers' clubs.

Five conservation farming courses for teachers and two conferences for chiefs were held, and at Bondolfi Mission the instructor designed and directed a conservation course for trainee teachers.

The institute has been host to several courses for women organized by the Federated Women's Institutes of Rhodesia. This training has been mainly concerned with leadership.

In a domestic sense the institute is involved in its own extension activities, sponsors a young farmers' club, nursery school, night school and a club for local women. The premises are used as a meeting place for nearby Y.F.C.s and farmers' associations.

This integration of the institute with the surrounding district and communities has developed an excellent attitude in all concerned. Local leaders now frequently assist at courses arranged by the institute.

The Alvord premises are old and have served well. Some of the buildings are now, however, beyond economic renovation and, as funds are available, the institute buildings are being replaced. A new dormitory block to house 32 was built and brought into use during the year.

Chalet accommodation has been improved and the Institute wired for electricity.

The training instructor stationed at Alvord since November, 1964, has been awarded a Diploma in Public Administration, with distinction, from the University College of Rhodesia and Nyasaland.

The acting training supervisor returned from a five-month course on rural development sponsored by Denmark and held in that country.

Kayisa

The appointment of a training instructor in charge of this institute has increased activity there, although at the end of the year the incumbent was changed. The institute has conducted refresher courses in extension methods for African field staff. Its main work was in the first quarter of 1965, when an intake of 34 new extension assistants underwent induction training.

In March, Matabeleland chiefs attended the Natural Resources Board Conservation Conference held at the institute, serviced by this department, and Training Branch particularly.

In August a conservation conference for teachers was organized at Kayisa, as follow-up to that for the chiefs.

A conference of chairmen and secretaries of co-operatives was also held at Kayisa.

Some provincial training is carried out at Tjolotjo and the Training Instructor at Kayisa supports these exercises as necessary. Result demonstrations, and farm visits for extension assistants have been so arranged.

Msengesi

More than 50 new extension assistants were given induction training at the institute and this was the last training exercise for conservation and extension conducted there.

Having been arranged that Ministry of Education take over the premises in December, 1965, Conservation and Extension is maintaining "caretaker" duties and the Training Instructor has been transferred to Midlands.

With a large intake of new extension assistants, most provinces have taken advantage of the situation by forming pegging teams, and this has necessitated special training in the use of the level.

Most provinces have followed up the conservation conferences for chiefs with training of headmen, but more generally provinces have arranged conservation conferences for school teachers and good rapport with the educational authorities has resulted.

Victoria Province has carried out an exemplary extension programme fully integrated with training courses held at the Alvord Institute. While there has been a slight decline in the number of master farmer trainees, this is more than counterbalanced by the increased number of interest group trainees at training centres.

LIBRARY

During the year the amalgamation of the old Conex library and the Ministry's library was achieved. The combined library is housed in an adequate and congenial building. For the first time for many years it can be said there is a central library. A considerable amount of use is being made of the facilities by the staff of the Ministry of Agriculture as a whole. During the year a further 62 books were added to the collection.

YOUTH EXTENSION SECTION

At its 1965 annual general meeting the Council of the Y.F.C. movement voted to change the name to the Rhodesian Association of Natural Resources Clubs incorporating Young Farmers' Clubs.

Mr. D. K. Hall, for many years the chairman of the national organization and since its inception an enthusiastic and dedicated supporter of the movement, tendered his resignation because he intends taking up farming in the Banket area. He was, however, unanimously elected as National President for the coming year.

Y.F.C. Publications

During the year Y.F.C., with the assistance of B.P. Rhodesia, arranged for a re-issue of the Y.F.C. Handbook.

At the annual general meeting a suggestion was that some attempt should be made for Y.F.C. to sponsor a "Report to the Nation" publication. A subcommittee was formed and the idea evolved for the publication of a book called "Of Service to the Farmer" in order to produce something similar to a British Ministry of Agriculture publication. This publication is to be issued, free of charge, to the farming community as a token of appreciation for their support of the Y.F.C. movement.

Activities

Mashonaland North and South.—African areas in these provinces are interested in the formation of young farmers' clubs. Clubs have been formed in Zowa (three) Chitomborgwizi (two) and Vuti (one).

Manicaland.—Clubs were formed at St. Augustine's Secondary School and at Old Umtali Mission, Hartzell Secondary School. There is also a possibility of clubs being formed in Tzonzo Purchase Area and the Holdenby T.T.L.

Midlands.—The Midlands executive committee ceased to function early in the year. Attempts are being made to revive it and there is interest among the farming community of Gwelo.

Victoria.—This province has been very active in the field of youth extension and the Training Officer at Alvord Institute has been responsible for the formation of a club. Youth extension has taken the form of skills training in an attempt to alleviate unemployment among rural youth and 26 new clubs were formed during the year. Several courses in leadership and youth extension methods were organized at Alvord.

Matabeleland.—A feature of youth extension progress in Matabeleland is the interest shown by the teacher trainees at the Training College. At the instigation of the Principal, students have elected to act as club leaders and helpers in local schools in a voluntary capacity.

Conservation Education

A large amount of time has been put into efforts, under this heading. Talks on conservation to schools, clubs and other groups have been given in many parts of the country. Committees have been set up at national and provincial level.

Mashonaland North and South.—The Conservation Education Committee's chairman resigned and the office is not yet filled. In African areas interest in conservation education has been stimulated, as a result of the conservation conferences for chiefs, headmen and chief's messengers. It is hoped that introduction of young farmers' clubs will help to satisfy this interest.

Manicaland.—The committee has functioned quite well and organized competitions, which included:

Senior schools—an essay on "Water".

Junior schools—a scrapbook on "Water".

An African school garden competition—53 schools entered and nine prizes were awarded.

These competitions were successful and it is hoped to repeat them. Outings for teachers were conducted during the year, to a coffee estate, fruit farm and water conservation project.

Midlands.—The Conservation Education Committee, active and enthusiastic, met regularly. The symposium on the theme "Water", which was attended by over 100 teachers, was successful, as was a conservation course for African teachers held at Mlezu School. Essay, scrapbook and model competitions were organized by the committee, also field trips for teachers.

Victoria.—The Conservation Education Committee met regularly and their programme was complimented by a full training programme at Alvord Institute and elsewhere. Thirty other staff trained in courses within this programme. Closer liaison now exists between the teachers and the extension staff.

Matabeleland.—The Conservation Education Committee organized six tours for European and African teachers related to the N.R.B. theme for 1965 "Water". A course for 30 African teachers from Tjolotjo district was organized as follow-up to the chiefs' conservation conference.

Rural Industries in Relation to Rural Youth Extension

In Victoria the aims of the Rural Youth Programme is to give young people training in skills—

of interest to them,

that will be of value in a rural environment and,

capable of giving a cash return for the time spent.

For example, the production of articles for the tourist trade from the residues of game farming, i.e. hides, horns, hoofs, etc. This type of project has been undertaken by a young farmers' club near Bondolphi R.C. Mission, where a lay brother, skilled in leather work, trains the group.

Extension Research

General

This section now consists of one European officer and one African research assistant. The latter joined the staff during the period under review.

Extension research continued to be conducted on a project basis; and findings were made available in the form of written reports and through direct liaison with extension staff. The Extension Research Officer also assisted on occasion with the formal training programme of the department, and provided advice on sociological matters when requested to do so.

It was decided to continue research on this basis in the immediate future for a variety of reasons. These included the need for extension agents to concentrate at this time on mechanical conservation, land use planning, and the service-giving aspects of their duties; the fact that, due to pressure of other work on the staff, it has not yet proved practicable to implement a standardized system of extension programme planning at either a national or a provincial level; and the need for specific types of information which this section is in the best position to obtain.

There was also a more specific reason. Government has undertaken to supply the Southern African Regional Committee on the Conservation and Utilization of the soil with further information regarding the present systems of land tenure in tribal areas. This is a matter of more than academic interest in view of the present policy of giving tribal land authorities control of land allocations in their own areas. Though there is no intention of trying to dictate to these tribal land authorities regarding the rules of tenure that they should apply, it is clearly essential for Central Government (and its advisory services) to have as full information as possible regarding the tenurial systems that actually are evolving in these areas.

It was decided that this section was in the best position to undertake the considerable research needed, and that this project should be given priority over other research requirements.

Training

The Extension Research Officer conducted a course on tribal area group identification for officers of the Midlands and Victoria provinces, and assisted the Chief Training Officer in two courses on effective supervision. In addition, several individual lectures were given to training courses and conferences.

The Extension Research Officer attended a three-day seminar on programmed instruction at the University College of Rhodesia and Nyasaland.

Visits to Other Countries

During February, 1965, the Extension Research Officer visited the Republic of South Africa. The aim was to study the systems of agricultural extension and extension research being practised there, the training of their extension staff, and the methods of the many agencies conducting directed research designed to assist government departments. A report on this visit has been submitted.

Reports

The following reports were submitted during the period under review:

1. Intensive extension in Nyabunda Purchase Area—Victoria Province.
2. Working with groups—Tjolotjo T.T.L.
3. The Charama Plateau.
4. Report on a visit to the Republic of South Africa.
5. An experimental sample socio-economic survey (Gutu East).

Publications Section

The long vacant post of Publications Officer was filled in the latter part of the year, and the officer appointed assumed duty on the 9th August, 1965.

A large proportion of the material written and published by the training, agronomy and engineering branches passes through the hands of this officer. It soon became evident that what was probably the most time-consuming aspect of his duties was the editing, revising, proof-reading and collating of various reports, technical memoranda and advisory bulletins, etc., and their distribution.

Papers and Publications

Two long-awaited publications have been completed during the year. The first was the reproduction of the "Short Courses for Farmers", consisting of 11 handbooks. These are for distribution to extension supervisors; each have received the full set of cyclostyled handbooks.

The Dam Construction Manual (the "Blue Book") has been completely revised, and is presently in the hands of the printers.

Messrs. N. W. Hudson, L. A. N. Robertson and D. C. Jackson produced 16 research bulletins, 11 of which have been published. Work on the five remaining articles is proceeding. Special recognition should be paid to these former officers of the department who remained on to complete the writing of these bulletins after having terminated their employment with this Government.

Tour Reports

Subsequent to their visits to other countries, reports were written by eight officers of this department.

1. Report on the Agricultural Aspects of the Chiefs' Tour of parts of Europe and South Africa by A. V. Oates.
2. Report of Study Tour, Farm Management Techniques, by N. A. O'Connell.
3. Study Tour Report, "Formosa", by Assistant Extension Officer A. Machiri.
4. Study Tour Report, "Formosa", by Extension Superintendent J. Kondo.
5. Study Tour Report, "Taiwan", by Extension Superintendent R. Mukonyora and Extension Superintendent T. Manase.
6. Study Tour Report, "Merrist Wood", by Extension Assistant W. Mbayiwa.
7. Study Tour Report, "Surrey Farm Institute", by Extension Assistant J. Mfiri.

A large number of specialized publications was completed during the year.

Numerous other papers have been produced on the premises for staff utilization and distribution.

In addition, the Publications Officer is required to prepare material specifically for our African staff and for the African sector of the farming community, and to this end the revision and in some cases translations of several articles into the Chishona and Sindabele languages has been effected.

I.C.A. Newsletters

Provinces are fully aware of the increasing need for newsletters and a large number are regularly produced and distributed in the various I.C.A.s, Purchase Areas and T.T.L. Areas. Other items produced include "handouts" for farmers attending meetings, and articles of specific interest to individual provinces.

Land Tenure Advisory Service

SPECIAL OPERATIONS

Eastern Districts Coffee Scheme

This scheme has been handicapped by difficulties in getting control of suitable land. Nevertheless, some settlement has taken place. The main effect of the scheme has been in arousing public interest in coffee and a considerable number of property transactions have taken place privately—particularly in the Vumba area—resulting in increases in plantings.

Wengi Irrigation Scheme

This scheme cannot be implemented until funds are available. The proposal for a "proving unit" run on commercial lines under supervision has met with approval generally and seems likely to materialize with assistance from the B.S.A. Company, the largest landowner concerned.

The unit will provide essential work study, costing and farming system information, as well as providing satisfying proof to potential settlers of what they may expect when the whole scheme can be implemented.

Proposals for resettlement of Under-used Land

Several schemes put forward by the public were considered at the request either of the Secretary for Agriculture or the Rural Land Board.

General Tenancy and Land Tenure

A general guide, "Your Farm Lease Contract", was prepared and issued. It is understood that it will be published in the R.A.J. Seventeen I.C.A. and group committees were addressed. An article was written for the Wenimbi I.C.A. Journal. Three broadcasts were undertaken.

Great difficulty is experienced in deciding what to advise in general articles and guides, as apart from certain general clauses lease agreements in this country are made to suit specific personal and farm conditions. This freedom is almost unknown in other countries where farm landlords and tenants are usually strictly regimented.

Whilst that freedom is most desirable—and essential to progress—it makes advice difficult unless there is access to a large number of leases providing the range of observation freely available to advisers on crops, livestock, etc.

A proposal was made that a copy of all farm leases be lodged for inspection and study and follow up study where desirable. It was ascertained from lawyers and accountants and several I.C.A. committees that this was quite unobjectionable and involved no more trouble than typing an extra copy and posting it. No action, however, has been taken.

During the year 22 leases were examined, arising from application to the Rural Land Board for loans.

A number of leases were examined which had to be criticized strongly as being extortionate or open to abuse.

Investigations

Apart from investigations mentioned above, two European settlement surveys were begun.

Macheke and Tokwe I.C.A.s were chosen as typical of areas in which settlement seemed to be in difficulties. Fortunately both I.C.A.s have able and enthusiastic committees from which full co-operation has been obtained.

The aim was to obtain the life history and views of every person who has farmed or owned land in these areas. This is now nearly complete and over 200 interviews obtained.

Having obtained the origins, educational and early training background, the man's working career is heard, how and why he entered farming and what his farming career has been, attitudes to Conex. I.C.A. Movement, R.N.F.U. sources of information most effective in influencing farming practices, attitudes to sons farming, thoughts on economic units and desired incomes, etc.

The attitude to irrigation by successful men was one of scepticism with one exception. Amongst others, that it would save them if they could get the capital, but none of these had any clear idea of costs and all had already shown in their careers their inability to perfect rain-fed farming techniques, hardly suggesting that they would succeed with the more difficult techniques and financial calculations needed in irrigation farming.

The information obtained through these investigations will be analyzed so as to establish the reasons for success or failure and thus enable us to provide guidance for future settlement and to those already experiencing difficulty.

General Advice to the Public

Some 281 office appointments were kept. Of these:

97 with immigrants, mostly from Kenya.

109 regarding leasing of land.

75 various matters, rents, areas suitable for farming ambitions, land values, family arrangements.

Discussions were held, with several attorneys and three accountants with farming practices, on leases, rents, income tax. Particular interest was shown by the accountants in methods of fixing managers' salaries where the owner—usually a widow—cannot supervise costs. It is understood that a small discussion group of the two professions may be formed to consider farming problems and that this section will be invited to attend.

Although the investigation mentioned previously and experience throughout the year suggests that the accountancy and legal professions contain many very able men familiar with farming problems and interested in them and that these men are perhaps more influential with farmers than other groups, all express marked reluctance to serve on Government committees whilst prepared to co-operate enthusiastically in private.

Preparations for an Effective Land Settlement

The conclusion that an effective programme of rural settlement, aimed at stable and contented settlement, must be based on the selection and placing of able men on suitable units, properly financed, leads to

the suggestion that it will only be achieved by some close co-operation between Conex, the accountancy and legal profession and credit sources, at I.C.A. or group level. That co-operation alone can know the individual circumstances and what pressures to exert at what time.

Leadership from the centre will be necessary but action must emanate from the I.C.A. or group, and be backed by Government support.

Accordingly all province and group officers have recently been addressed by the Land Tenure Officer on the importance of breathing life into rural settlement, identifying suitable opportunities and encouraging them in all the ways familiar to a properly trained extension officer.

A considerable amount of time has been spent in mastering the details of Income Tax practice and studying the farming systems and costs material available.

It should be possible in time for the next settlement season—February to August—to issue explanatory material on the advantages to a landowner of providing settlement opportunities and of financing them and selecting his tenant himself.

When this material is ready the full support of organizations such as the Natural Resources Board will be necessary and, as in the early days of conservation work, of the better-known figures in the farming world. Such support should be directed to put the able man on a sound unit, soundly financed, or the evidence of the past suggests that we may once again settle men only to lose the majority of them by the first adverse climatic or market wind.

GENERAL

(See Appendix XI)

Visits to Farms

Farm visits resulting in personal contact with farmers, the most effective media of extension, have been maintained during the first half of the year, but in view of the reorganization and redistribution of staff resources the previous very high level of services in the European farming sector of the industry cannot be maintained. Because of some reduction in mileage allocations the effectiveness of our services has been reduced somewhat, and this is likely to continue until adequate funds are voted to provide the essential tools (mileage) for officers to perform the duties for which they are employed. Every endeavour is being made to make the best use of resources to maintain a satisfactory service by resorting and relying to a great extent on mass media contact through discussion groups and field days.

In completing the exercise to provide a truly unified service to the different sectors of the farming industry, staff work areas have been changed from a farming and Tribal Trust land subdivision of responsibility to a geographic basis with effect from the 1st October, 1965. This change has been made in the interest of providing a more effective and economical use of staff and financial resources.

A total of 60,631 hours, representing 33.8 per cent. of time worked in Tribal Trust lands, and 90,375 hours, representing 39.3 per cent. of time worked in farming areas, have been spent on general advisory works and soil and water conservation this year.

Generally in the Tribal Trust land extension has been conducted through interest groups making extensive use of test demonstrations, thus enabling people to learn about good husbandry practices through the well-tried technique of "learning by doing".

A lot of time has been spent on in-service training courses covering a large range of subjects. These courses proved of great value to staff in keeping them abreast of latest developments in their work.

Farmers' Days and Discussion Groups

During the year there has been a considerable increase in the number of field days and discussion groups held.

The tendency has been for large national and provincial field days covering a wide range of subjects to be replaced by smaller and more local interest group discussions and field afternoons. These smaller gatherings proved more effective in drawing the less advanced farmer and getting him to participate.

With restricted mileage allocations, mass advice through the medium of field days and discussion groups will have to be intensified to compensate for individual visits which staff will not be able to maintain at previous levels.

Agricultural Shows

Departmental exhibits were staged at all the main shows in the country. Although our show exhibits attracted a great deal of attention and received favourable comment, it is a most time-consuming practice.

In African areas a number of shows were held, with excellent attendance and good entries on the average.

All staff associated with the preparation and presentation of exhibits both at the national and country shows deserve credit for the generally high standard of exhibits.

I.C.A. Committees

I.C.A. and group committees continued to meet regularly, and with the reduction of services in the European areas, committees have come forward to overcome difficulties by making the necessary arrangements for farmer training in the use of the level in many areas. Committees in African Purchase Areas also met regularly. African committees require more guidance and instruction in their functions as committees in order to be more effective. With one or two exceptions the relationship between committees and staff has been good.

Co-operatives and the Agricultural Loan Fund

During the year there was a marked expansion in the coverage of the Purchase and Tribal Areas by the formation of new co-operatives—a most gratifying development.

The Agricultural Loan Fund, from which loans are available throughout co-operatives and district loan committees, proved of great assistance to African farmers in putting into practical effect the advice given by the department. In spite of the poor season farmers who applied for fertilizer loans reaped the benefit in the form of very marked increased yields.

While the establishment of loan facilities to African farmers through the Agricultural Loan Fund is the greatest single stimulus African agriculture has had for years, the direct involvement of extension staff in the administration and allocation of loans is undesirable, and this could lead to poor relationship between farmers and their advisers.

CONCLUSION

Although there were many difficulties and problems during the past year, the report nevertheless reflects satisfactory progress. The major task lies in the African areas and unless the development of agriculture and better land use is speeded up considerably, we can only hope to retain the present position with a serious risk of losing the battle against the forces of nature.

As this is the last report I will submit prior to my retirement, one cannot help but look back over many years of service in the country. The conservation of soil and water and the progress in soil crop management as well as in livestock production is evidence of the progressive outlook of the farming community and the services rendered by this department in close co-operation with the Natural Resources Board and I.C.A. Organization. An everlasting monument to all concerned with this wonderful work.

It has indeed been a privilege and a pleasure to serve the farming community of this country and I am confident that the future of the agricultural industry is bright. I wish to sincerely thank the Natural Resources Board and its I.C.A. Organization, the R.N.F.U. and farmers' associations, the R.T.A. and Tobacco Research Board, the Rural Land Board and numerous other organizations with whom I or members of my staff have been associated during the year and in the past, for the help and kind assistance we have enjoyed. Also to my colleagues in other Ministries who have helped us in many respects, my grateful appreciation for such co-operation.

To my own staff I am deeply indebted for such loyal and unselfish support to ensure that our duties were executed in a responsible and efficient manner. Conex will forever remain my love and my pride.

My very best wishes to you all and for a happy and prosperous agricultural industry in this wonderful country.

J. J. DUVENAGE,
Director of Conservation and Extension.

VISITS TO OTHER COUNTRIES

1. Mr. A. V. Oates, Deputy Director of Conex, was the Ministry of Agriculture representative on the second tour made by chiefs and Government officials from May to July, 1965. Their visit took them to Greece, Italy, Great Britain, Portugal and the Republic of South Africa.

2. Mr. B. Elkington is presently in England attending a community development course run by Dr. Batten. He left this country on 26th September and is expected to return on or about 16th December.

3. Mr. B. Pieters, Extension Officer in the Gwanda area (Beit Bridge), successfully completed an A.I. course at Onderstepoort when he visited South Africa on study leave.

4. The Senior Planning Officer, Mr. P. Ivy, visited Borgo a Mazzano in Italy during October and November. From there he proceeded to the United Kingdom where he studied Land Settlement Schemes in Sidelsham, and on the polders in Holland. He returned to this country in early December. The study visit to Italy over a period of five weeks was sponsored by the U.K.F.F.H. Campaign.

5. Other officers of the department who visited Borgo a Mazzano were the Economist, Mr. G. Thorpe, Mr. D. Plowes, Assistant Provincial Conservation and Extension Officer, Manicaland, Mr. J. Brown, Provincial Planning Officer, Mashonaland North, and two Assistant Extension Officers, Messrs. J. Shumba and W. Rugoyi, of the Midlands and Fort Victoria provinces, respectively.

6. The Chief Tobacco Officer attended the Second International Tobacco Trade Congress in Instanbul from 16th–26th September, 1965. He presented a paper on "The Training and Education of Tobacco Advisory Personnel".

7. Two extension supervisors, R. Mukonyora and T. Marase, of Manicaland Province, visited Taiwan on a study tour over the period 15th February, 1965, to 17th July, 1965.

8. Extension Supervisors, J. Tobani and J. C. Chambe, of the Mashonaland North and Mashonaland South provinces, respectiveley, are presently on a five-month study course in Taiwan. They left this country on the 14th August, 1965.

9. The Acting Training Supervisor, Mr. J. J. Dowa, of the Alvord Training Institute, returned in December from a five months' study course at the Holte Rural Development College in Denmark.

10. Mr. Paul Mushore, an extension assistant of the Victoria Province, spent nine months in the U.K. on a study course, sponsored by the Roman Catholic Church, over the period October, 1964 to July, 1965.

11. Mr. N. Moyo, an extension assistant in the Midlands Province, accompanied the chiefs as an interpreter on their tour of Europe and South Africa over the period May to July this year.

12. Mr. Mhlalewa, and extension assistant stationed at Essexvale, is at present on a rural development study course in Denmark.

13. Extension Assistant Tandi Mawariri, of Midlands Province, left Salisbury in September this year to attend a nine months' study course at the Surrey Farm Institute in the U.K. under a fellowship of the Nuffield Foundation.

14. Whilst on leave in the Republic of South Africa, Mr. R. H. G. Howden visited the Pineapple Research Station at East London, and he has since written a short report on the subject of pineapple production.

15. In all 19 officers of this department visited various other countries during the year.

LIST OF COMMITTEES OR BOARDS ON WHICH SENIOR OFFICERS SERVED

The Directorate, or their representatives, served on the following committees or boards:

Conservation Education Committee of the Natural Resources Board.
Water Resources Committee of the Natural Resources Board.
General Purposes Committee of the Natural Resources Board.
Natural Resources Board.
Tribal Trust Land Committee of the Natural Resources Board.
Young Farmers' Club Council.
Young Farmers' Club Executive.
Gwebi College Council.
Chibero Agricultural College Council.
Technical Committee on Fertilizer.
Henderson Research Station Farm Unit Committee.
Agricultural Production Committee (Main).
Agricultural Production Executive Committee.
A.P.C. Grains Subcommittee (Chairman).
A.P.C. Cattle Committee.
Tsetse Areas Co-ordinating Committee.
Fibre Production Committee.
Rhodesian Research Advisory Committee.
Chiredzi Research Advisory Committee.
Hydrological Co-ordinating Committee.
Rhodesia Cotton Growers' Association.
Pasture Seeds and Horticultural Crops Committees.
Seed Production Council.
R.N.F.U. Farm Management Committee.
Standing Committee on Agricultural Mechanization.
Sabi Development Farm Committee (Chairman).

Ministry Show Committee (Chairman).
Field Experiment Committee (Chairman).
Work Planning Committee.
Farm Buildings Advisory Committee (Chairman).
Livestock Improvement Committee (Chairman).
Southern African Regional Committee for the Conservation and Utilization of the Soil.
Mashona Cattle Society.
Tuli Cattle Society.
Tobacco Research Board.
Rhodesia Tobacco Marketing Board.
Rhodesia Tobacco Seed Association Executive Committee.
Rhodesia Tobacco Seed Association Technical Committee.
Burley Tobacco Growers' Association.
Oriental Advisory Committee.
Domboshawa Co-ordination Committee.
Rural Land Board.
Rural Land Board Subdivision Committee.
Rural Land Board Finance Committee.
Rural Land Board Subcommittee on Land Settlement.
Bothashof School Council.
Artificial Insemination Committee.
Freedom From Hunger Campaign National Committee.
Freedom From Hunger Campaign Projects Subcommittee.
Tribal Trust Land Planning Committee.
News Dissemination Committee.
Water and Land Development Subcommittee of Sabi-Lundi Authority.
Wild Life Conservation Committee of the Natural Resources Board.
African Loan Fund Committee.
Farm Buildings Advisory Committee.
African Farmers' Liaison Committee with the Ministry.
Standards Association of Rhodesia.
Ploughing Association of Rhodesia.
World Ploughing Organization (local committee).
Domboshawa Staff Co-ordinating Committee.
African Development Fund Tender Board.
Engineering Committee.
Water Control Committee.
Farm Buildings Manual Committee.
Farming Systems Demonstration Committee.
Tillage Trials Working Group.
Rhodesia Agricultural Journal.

APPENDIX III

PUBLICATIONS

	Title	*Author*	*Publication*
1.	Five Years' Study of Ranch Breeding Stock 1959–64.	M. Bauer	*Rhodesia Agricultural Journal*
2.	Beef Production on Tobacco Farms	L. H. Cruttenden	*Tobacco Journal*
3.	Latest Notes on Lantana Control	H. L. V. Ellis	*Shell Farmer*
4.	Swarms	Miss P. Papadopoulo	*Rhodesian Garden and Countryside*
5.	How to Catch a Swarm	Miss P. Papadopoulo	*Rhodesian Garden and Countryside*
6.	Establish Colonies	Miss P. Papadopoulo	*Rhodesian Garden and Countryside*
7.	Transferring	Miss P. Papadopoulo	*Rhodesian Garden and Countryside*
8.	Poison Fumes	Miss P. Papadopoulo	*Rhodesian Garden and Countryside*
9.	Average Swarm	Miss P. Papadopoulo	*Rhodesian Garden and Countryside*
10.	Care of Swarms	Miss P. Papadopoulo	*Rhodesian Garden and Countryside*
11.	The Supers	Miss P. Papadopoulo	*Rhodesian Garden and Countryside*
12.	Extraction	Miss P. Papadopoulo	*Rhodesian Garden and Countryside*
13.	Care of Honey	Miss P. Papadopoulo	*Rhodesian Garden and Countryside*
14.	Rendering Beeswax	Miss P. Papadopoulo	*Rhodesian Garden and Countryside*
15.	Enemies of Bees (1/1)	Miss P. Papadopoulo	*Rhodesia Agricultural Journal*
16.	Enemies of Bees II	Miss P. Papadopoulo	*Rhodesia Agricultural Journal*
17.	Green Basket Hives	Miss P. Papadopoulo	*Rhodesia Agricultural Journal*
18.	Pollination	Miss P. Papadopoulo	*Rhodesia Agricultural Journal*
19.	Honey, Food of Gods	Miss P. Papadopoulo	*Rhodesia Agricultural Journal*
20.	Beekeeping for Profit and Pleasure	Miss P. Papadopoulo	*Rhodesian Tobacco Journal*
21.	Weekly Tobacco Bulletins	Members of Tobacco Branch	*Rhodesian Farmer*
22.	Burley Reaping	J. W. Hayward	*Tobacco Forum*
23.	Burley Curing	J. W. Hayward	*Modern Farming*
24.	Soils Selection	J. W. Hayward	*Tobacco Forum*
25.	Training of Conex Personnel	G. Milligan	*Tobacco Forum*

	Title	*Author*	*Publication*
26.	Water Planting	G. Milligan	*Tobacco Forum*
27.	Seed Bed Management	G. Milligan	*Modern Farming*
28.	Oriental Tobacco Future	D. Lynn	*Tobacco Forum*
29.	The Training and Education of Tobacco Advisory Personnel.	J. W. Hayward and G. Milligan	*Paper presented at the 2nd International Tobacco Trade Congress*
30.	Records—The basis for Success	I. Stansby	*Tobacco Forum*
31.	So You Want to Go Farming?	I. Stansby	*Rhodesia Herald Show Supplement*
32.	Results of a Preliminary Investigation into Cotton Picking.	J. de Jong	*Rhodesia Agricultural Journal*
33.	Work Study Manual—Interim Revisions Now Released.	B. Duncan	*Rhodesian Tobacco Journal*
34.	Hang Under the Stick—or Without the Stick	B. Duncan	*Rhodesian Tobacco Journal*
35.	String Bulking or String Baling Have Most Possibilities.	B. Duncan	*Rhodesian Tobacco Journal*
36.	Conventional Grading Is Still the Best	B. Duncan	*Rhodesian Tobacco Journal*
37.	Serious Disadvantages of the Conventional Press.	B. Duncan	*Rhodesian Tobacco Journal*
38.	Conveyor Belt Grading	G. Wilson	*Rhodesian Farmer*
39.	New Trends in Rhodesian Tobacco Growing	B. Duncan	*Tobacco (New York)*
40.	Work Study—A New Concept in Rhodesian Agriculture.	B. Duncan	*Rhodesia Herald Show Supplement*
41.	Planning, A Process of Systematic Thought	M. Keech	*Rhodesia Agricultural Journal*

Booklets

"The Economics of Maize Tillage Operations" was prepared by I. Stansby.

"Work Study on Handling Tobacco", compiled by B. Duncan and distributed to all growers by R.T.A. This booklet was published as an interim report for the 1964–65 season; meanwhile, the R.T.A. Work Study Manual has been revised, and the new sections should be sent to growers during the 1965–66 season.

"Work Study on Maize Harvesting", compiled by B. Duncan and issued on request.

"Guide to Cattle Handling", compiled by K. Davies and issued on request.

In addition, a booklet on cotton operations has been prepared by J. de Jong and is at present with the printers. It should be available to farmers in October.

A booklet on burley tobacco is being prepared by G. Wilson. It should be available to growers by the end of the year.

A paper entitled "Identifying and assessing problem areas in soil erosion surveys using aerial photographs", by M. Keech and R. G. B. Jones, is under preparation and has been accepted in advance by the Paris Headquarters of the Inter African Bureau for Soils for publication in "Sols Africains".

In addition to the above items, other articles were written by members of staff and published in various newspapers and magazines or in the form of technical memoranda.

APPENDIX IV

DETAILS REGARDING OPERATION OF LIVESTOCK IMPROVEMENT SCHEME

A. Purchase of Stock by the Committee on Behalf of Farmers

1. CATTLE

	1.10.64 to 30.9.65	*1.10.63 to 30.9.64*	*1.10.62 to 30.9.63*
Pedigree bulls	—	2 for £693	16 for £3,621
Pedigree females	—	—	—
Grade females	—	—	—
TOTALS	—	2 for £693	16 for £3,621

2. DETAILS OF BREEDS PURCHASED

Bulls	*1.10.64 to 30.9.65*	*1.10.63 to 30.9.64*	*1.10.62 to 30.9.63*
Africander	—	—	1 for £705
Aberdeen Angus	—	—	3 for £935
Friesland	—	2 for £693	1 for £350
Hereford	—	—	7 for £1,468
Sussex	—	—	—
TOTALS	—	2 for £693	16 for £3,614

Females	*1.10.64 to 30.9.65*	*1.10.63 to 30.9.64*	*1.10.62 to 30.9.63*
	—	—	—

3. SHEEP

Rams	*1.10.64 to 30.9.65*	*1.10.63 to 30.9.64*	*1.10.62 to 30.9.63*
Dorper	4 for £120	51 for £780	57 for £980
German Merino	—	—	3 for £50
Suffolk	—	3 for £110	1 for £150
Southdown	—	1 for £50	1 for £50
Hampshire	1 for £50	1 for £30	1 for £30
TOTALS	5 for £170	56 for £970	62 for £1,160

Ewes	*1.10.64 to 30.9.65*	*1.10.63 to 30.9.64*	*1.10.62 to 30.9.63*
Corriedale	100 for £500	—	—
Dorper	—	122 for £935	121 for £795
German Merino	—	—	5 for £40
Southdown	—	1 for £20	1 for £25
TOTALS	100 for £500	123 for £955	127 for £860

B. Import Permits Approved for Livestock from South Africa

1. CATTLE

Bulls	*1.10.64 to 30.9.65*	*1.10.63 to 30.9.64*	*1.10.62 to 30.9.63*
Aberdeen Angus	—	2	6
Africander	38	4	46
Brown Swiss	1	—	3
Brahman	2	11	2
Charolais	—	—	1
Dexter	1	—	—
Friesland	3	2	—
Guernsey	—	—	7
Hereford	30	6	25
Jersey	5	3	4
Lincoln Red	—	—	7
Red Poll	—	1	1
Shorthorn	9	2	3
Sussex	21	43	20
South Devon	14	4	4
Santa Gertrudes	—	—	7
TOTALS	124	68	136

Females	*1.10.64 to 30.9.65*	*1.10.63 to 30.9.64*	*1.10.62 to 30.9.63*
Africander	60	—	44
Brahman	2	—	—
Brown Swiss	2	—	—
Dexter	1	—	—
Friesland	30	—	4
Hereford	2+10 calves	10	10
Jersey	14	—	—
Shorthorn	6	6	—
Sussex	42	32	—
TOTALS	159+10 calves	48	58

2. SHEEP

Breed	*Rams*	*Ewes*
Corriedale	—	100
Dorper	50	560
German Merino	5	160
Hampshire	5	6
Merino	—	50
Persian	1	—
Suffolk	10	83
Van Rooy	10	40
TOTALS	81	999

3. GOATS

Breed	*Rams*	*Ewes*
Angora	1	40
Boergoat	16	75
TOTALS	17	115

4. PIGS

Breed	*Boars*	*Gilts/Sows*
Landrace	1	—
TOTALS	1	—

C. Import Permits Approved for Livestock from Overseas

1. CATTLE

United Kingdom	*1.10.64 to 30.9.65*		*1.10.63 to 30.9.64*		*1.10.62 to 30.9.63*	
	Bulls	*Females*	*Bulls*	*Females*	*Bulls*	*Females*
Aberdeen Angus	1	—	2	—	—	—
Ayrshire	1	—	4	—	5	—
Hereford	4	10	3	—	2	2
Friesland	1	—	—	—	1	—
Shorthorn	1	2	—	—	1	—
TOTALS	8	12	9	—	9	2

Holland	*1.10.64 to 30.9.65*		*1.10.63 to 30.9.64*		*1.10.62 to 30.9.63*	
	Bulls	*Females*	*Bulls*	*Females*	*Bulls*	*Females*
Friesland	—	—	1	—	3	15
TOTALS	—	—	1	—	3	15

United States	*1.10.64 to 30.9.65*		*1.10.63 to 30.9.64*		*1.10.62 to 30.9.63*	
	Bulls	*Females*	*Bulls*	*Females*	*Bulls*	*Females*
Brahman	—	—	6	39	—	—
Brangus	—	—	1	—	—	—
TOTALS	—	—	7	39	—	—

Italy	*1.10.64 to 30.9.65*		*1.10.63 to 30.9.64*		*1.10.62 to 30.9.63*	
	Bulls	*Females*	*Bulls*	*Females*	*Bulls*	*Females*
Romangnola	1	8	—	—	—	—
TOTALS	1	8	—	—	—	—

France	*1.10.64 to 30.9.65*		*1.10.63 to 30.9.64*		*1.10.62 to 30.9.63*	
	Bulls	*Females*	*Bulls*	*Females*	*Bulls*	*Females*
Charolais	—	6	—	—	—	—
TOTALS	—	6	—	—	—	—

	1.10.64 to 30.9.65		*1.10.63 to 30.9.64*		*1.10.62 to 30.9.63*	
	Bulls	*Females*	*Bulls*	*Females*	*Bulls*	*Females*
GRAND TOTAL	15	26	15	39	12	17

2. SHEEP

United Kingdom	*Males*	*Females*
Wiltshire Horn	1	—
TOTALS	1	—

3. PIGS

United Kingdom Breed	*Males*	*Females*
Large White	3	6
Landrace	1	2
Welsh	1	—
TOTALS	5	8

D. Import Permits Approved for Livestock from Zambia

CATTLE

Breed	*Bulls*	*Females*
Angoni	2	3
Mashona	—	143
TOTALS	2	146

APPENDIX V

RECORD OF THE MAIN SUBJECT HEADINGS COVERED BY FORMAL TRAINING ORGANIZED BY TRAINING BRANCH WITH THE CO-OPERATION OF OTHER SPECIALIST OFFICERS

Course subject	*No. of courses held*	*Participation Nos.*		
		Conex	*Other depts.*	*Others*
Biological Conservation	1	26		
Cotton	3	66	2	
Effective Supervision	3	17		
Extension Methods	2	35	2	
Farm Management	3	22	3	
Irrigation	2	38	3	
Land Use Planning	4	33	4	10
Mechanical Conservation	2	48		
Public Speaking	4	38	16	
Training Methods	4	33	14	
Work Study	2	27	2	

In addition to the above, certain subjects were dealt with in a series of co-ordinated training sessions, each session held at a significant time of the year or season.

1. *Beekeeping*

   Three groups of seven conservation and extension officers have been trained. Each group attended four sessions during the year.

2. *Tobacco*

   Eight sessions were held during the year and 20 officers of conservation and extension were trained.

3. *Beef Cattle Management*

   The Animal Husbandry Officer, Conex, visited each province during the month of March and held a one-day refresher course which all available officers attended.

4. *Farm Machinery*

   Engineering Branch has also conducted its own training at the Farm Machinery Centre at Domboshawa, and carried out the following programme:

   6 one-week courses for tractor drivers (Standing Committee);
   2 one-week courses for farmers (Standing Committee);
   1 two-week course for farmers which was designed to equip farmers with the knowledge to run their own simple tractor driver courses on the farm (Standing Committee);
   2 four-day European staff courses;
   1 one-week European staff course;
   1 two-week African staff course;
   1 one-week African staff course;
   1 one-week African contractor's course.

LIST OF PROVINCES AND GROUPS

Province	*Group*	*I.C.A.s, A.P.A.s and T.T.L.s*
Mashonaland North	Banket	Banket I.C.A. Ayrshire South I.C.A. Trelawney I.C.A. Darwendale I.C.A. Ayrshire North I.C.A. Nyakapupu A.P.A. Kachuta T.T.L.
	Bindura	Mt. Darwin I.C.A. Chesa West A.P.A. Kandeya A.P.A. Karuyana A.P.A. Gutsa, Mzarabani. Mukumbura, Chiswiti T.T.L.s. Chesa East A.P.A. Bushu–Madziwa T.T.L.s. Masoso, Chimonda T.T.L.s.
	Mazoe	Glendale I.C.A. Chiweshe South T.T.L. Shamva I.C.A. Bindura I.C.A. Barwick I.C.A. Marodzi–Tatagura I.C.A. Masembura T.T.L. Msana T.T.L. Chiweshe North T.T.L.
	Karoi	Karoi Central I.C.A. Karoi North I.C.A. Karoi South I.C.A. Tengwe I.C.A. Urungwe E/W T.T.L. Piriwiri T.T.L. Rengwe T.T.L. Vuti I.C.A. Mkwichi T.T.L.
	Sinoia	Angwa N/S I.C.A. Zowa A.P.A. Chitomborgwisi A.P.A. Doma I.C.A. Zimba T.T.L. Umfuli T.T.L. Magondi T.T.L.
	Umvukwes	Centenary W/E I.C.A. Umvukwes–Horseshoe I.C.A. Sipolilo T.T.L. Bakasa T.T.L. Dande T.T.L.
Mashonaland South	Salisbury South West	Central Mondoro T.T.L. Mrewa. Mangwendi–Ugumba–Maramba–Tengwe T.T.L.s. Ngesi T.T.L. Beatrice I.C.A. Chinyika–Chikwata–Kunzwi. Norton I.C.A. North Mondoro T.T.L. Salisbury South I.C.A. Muda and Mariangwe A.P.A.
	Mtoko-Mrewa	Mtoko T.T.L. Mudzi T.T.L. Mkoto T.T.L. Chikwizo T.T.L. Uzumba T.T.L. Marambwa T.T.L. Fungwe T.T.L. $\left\{\begin{matrix}\frac{3}{4}\\\frac{1}{4}\end{matrix}\right.$ Mangwende T.T.L.
	Marandellas South	Chimbshanda A.P.A. Dowa A.P.A. Wedza T.T.L. Wedza N.I.S. Soswe T.T.L.

Province	*Group*	*I.C.A.s, A.P.A.s and T.T.L.s*
	Umfuli–Gatooma	Umsweswe–Sokis I.C.A. Gadzema–Suri-Suri–Umfuli I.C.A. Msengezi–Selous I.C.A. Chenjiri–Sonyati I.C.A.
	Marandellas North	Wedza–Chimbhanda I.C.A. Bromley–Shangure–Marandellas West I.C.A. Marandellas N.–Wenimbi I.C.A. Chiota T.T.L. Seke T.T.L. Chinyika T.T.L.
	Salisbury North	Chinamora T.T.L. Salisbury West–Gwebi–Hunyani I.C.A. Arcturus–Ruwa Small Holdings I.C.A. Chikwaka T.T.L. Kunzwi.
	Macheke	Macheke I.C.A. Nyandora I.C.A. Mtoko I.C.A. Chitowa A.P.A. Budjga A.P.A. Dowa I.C.A.
Matabeleland	Shangani	Machingwe–Shangani–Insiza I.C.A. Essexvale I.C.A. Filabusi I.C.A. Godhlawayo A.P.A. Belingwe–Shabani I.C.A. Malele I.C.A. Gwatemba I.C.A. Insiza–Godhlawayo, Glass Block T.T.L.s.
	Matobo	Figtree N. Matopos I.C.A.s. Matopos S. I.C.A. Kumalo–Gulati T.T.L.s. Mt. Sibali A.P.A. Mzingwane–Duncal T.T.L.s. Mzinyatini–Matopos T.T.L.s. Nswazi–Tuli Outspan T.T.L.s. Semokwe–Shashani T.T.L.s. Mbongold–Seear T.T.L.s. Man Bali Maribeha T.T.L.s.
	Wankie	Matetsi I.C.A. $\frac{1}{3}$ Wankie T.T.L. Gwaai I.C.A. $\frac{1}{3}$ Lupane T.T.L. Lupanda A.P.A. $\frac{2}{3}$ Wankie T.T.L. Manjolo–Siabuwa T.T.L. Busi–Dandanda T.T.L. Lubimbi T.T.L. $\frac{2}{3}$ Lupane T.T.L. Mzola T.T.L. Lupanda A.P.A.
	Bulawayo	L. Umgusa–L. Khami I.C.A. Upper Umgusa–Upper Khami I.C.A. Mtabazinduna T.T.L. Fingo A.P.A. Inyoti I.C.A. Inyati T.T.L. Nkosikazi T.T.L. Bubi I.C.A. Nkosikazi A.P.A.
	Gwanda	Mtetengwe–Diti–Chipisi T.T.L.s. Part Limpopo–Shashi T.T.L. Wenlock–Matshetske. Gwanda–Dibilishaba–Shashi T.T.L.s. Shashani–Kumalo. Siyoko–Dendelle T.T.L. Machuchuta–Maramani T.T.L. Masera. Gwanda I.C.A. Tuli–Limpopo I.C.A.

Province	*Group*	*I.C.A.s, A.P.A.s and T.T.L.s*
	Bulawayo Farming	Upper and Lower Umgusa I.C.A. Upper and Lower Khami I.C.A. Essexvale I.C.A.
	Plumtree	Inyati. Nata–Mpimbila–Maitengwe T.T.L. Ramakwebana–Ingwezi–Raditladi T.T.L. Zinyama A.P.A. Plumtree I.C.A. Marula I.C.A. Tjolotje T.T.L.
Midlands	Gwelo	Tokwe I.C.A. Selukwe I.C.A. Selukwe. Vungu I.C.A. Upper Ngezi I.C.A. Gwelo I.C.A. Gwelo East I.C.A. Silobela A.P.A. Lower Sabi T.T.L. Gokomera A.P.A. Vungu A.P.A. Que Que T.T.L. Selukwe T.T.L. Jobolinko A.P.A. Nkai T.T.L.
	Belingwe–Shabani	Belingwe T.T.L. Lundi–Chibi T.T.L. Maziwa T.T.L. Bungowa A.P.A. Wenza A.P.A. Burgowa T.T.L.
	Charter East	Wiltshire A.P.A. Barwick A.P.A. Mboe A.P.A. Mbira S.N.A. Narira T.T.L. Sabi North T.T.L. Mtoro A.P.A. Gamonya A.P.A. Majumba A.P.A.
	Charter	Featherstone I.C.A. Majoi A.P.A. Enkeldoorn I.C.A. Marondo–Mashamu A.P.A. Cripps Farm T.T.L. Manyene T.T.L. Hunyani T.T.L. Umvumo–Tokwe I.C.A. Chilimanzi T.T.L. Lancashire A.P.A.
	Gokwe	Nemangwe–Mkore T.T.L. Copper Queen A.P.A. Munyati T.T.L. Kana T.T.L. Unreserved Land T.T.L.
	Que Que	Battlefields I.C.A. Umniati–Sebakwe I.C.A. Ngondoma–Sessombi I.C.A. Silobela T.T.L. Zhombe T.T.L.
Manicaland	Irrigation	Nyanyadzi (Melsetter) T.T.L. Umvumvumvu. Devuli (Buhera) T.T.L. Mutema. Mutema–Tawona (Chipinga) T.T.L. Musikavanthu T.T.L. Chibuwe (Chipinga). Maranke (Umtali) T.T.L.

Province	*Group*	*I.C.A.s, A.P.A.s and T.T.L.s*
	Umtali	Umtali S. I.C.A. Muromo T.T.L. Umtali N. I.C.A. Tsonzo A.P.A. Mutasa T.T.L. Zimunya T.T.L. Dora T.T.L. Makoni, Manyika T.T.L. Bannockburn T.T.L. Maronke T.T.L.
	Odzi–Buhera	Odzi I.C.A. Makuni A.P.A. Ziyambe A.P.A. Sabi T.T.L. Sabi T.T.L. Sabi T.T.L.
	Headlands	Mayo I.C.A. Tanda A.P.A. Tanda T.T.L. Chikore T.T.L. Headlands I.C.A. Chinyika I.C.A. Weya T.T.L. Rusape I.C.A. St. Faith's A.P.A. Zonga A.P.A. Chiduku T.T.L. Part Chiduku T.T.L. Tsungwesi I.C.A.
	Inyanga	Nyamaropa T.T.L. Inyanga T.T.L. Sawanyama T.T.L. Inyanga North T.T.L. St. Swithins T.T.L. Matisi–Nyamudira T.T.L. Inverness T.T.L. Inyanga I.C.A. Zimbiti T.T.L. Holdenby T.T.L. Manga T.T.L. Nyamaropa Irrigation.
	Chipinga	Cashel I.C.A. Mahandaruma A.P.A. Mahandarume T.T.L. Mutambara T.T.L. Mutambaro Irrigation. Melsetter I.C.A. Biriwiri A.P.A. Ngorima–Muwushu T.T.L. Mutema Highlands T.T.L. Chipinga I.C.A. Chipinga A.P.A. Ndowoyo T.T.L. Rowa–Chinyawhera T.T.L.s. Rowa–Chinyawhera A.P.A.s.
Victoria	Victoria Central	Bikita T.T.L. Bikita T.T.L. Matsai T.T.L. Ndonga T.T.L. Ndonga T.T.L. Ndonga T.T.L. Nyahunda A.P.A. Mungwesi A.P.A. Zimutu T.T.L. Mashaba T.T.L. Mashaba T.T.L.
	Highveld and Lowveld	Victoria Central East–Sabi Valley I.C.A. Mshagashe I.C.A. Umshandige A.P.A. Chiredzi I.C.A. Nuanetsi I.C.A.

APPENDIX VI (*Continued*)

Province	*Group*	*I.C.A.s, A.P.A.s and T.T.L.s*
	Victoria South	Matibi II Irrigation T.T.L.
		Gonakudzingwa A.P.A.
		Matibi I
		Sengwe–Moranda.
		Chibi South T.T.L.
		Chibi North T.T.L.
		Victoria –Nyadjena T.T.L.
		Mtilikwe T.T.L.
		Mshawasha A.P.A.
	Gutu	Gutu T.T.L.
		Dewure T.T.L. and A.P.A.
		Nyazwidzi A.P.A.
		Gutu I.C.A.
		Chatsworth I.C.A.
		Serima T.T.L.
		Eastdale T.T.L.
		Chikwanda T.T.L.
		Mazari T.T.L.

APPENDIX VII

CONTOUR RIDGES/STORM DRAINS AND OTHER WORK

Province	*Period*	*Contour ridges and storm drains miles*	*Waterways miles*	*Roads and road drains miles*	*Bush clearing acres*	*Drainage acres (surface and subsurface)*
Mashonaland South	1964–65	3,776	67	111	—	160
	1963–64	1,500	14	78	—	—
Mashonaland North	1964–65	7,374	103	219	25	100
	1963–64	4,633	32	226	1,054	—
Midlands	1964–65	3,053	81	71	451	—
	1963–64	413	34	152	1,060	—
Victoria	1964–65	1,986	—	11	200	—
	1963–64	804	8	5	85	—
Matabeleland	1964–65	603	40	15	2,628	—
	1963–64	334	11	13	—	—
Manicaland	1964–65	1,274	10	21	55	—
	1963–64	1,094	7	50	—	—
TOTAL	1964–65	18,066 miles	301 miles	448 miles	3,159 acres	260 acres
	1963–64	8,778 miles	106 miles	524 miles	2,199 acres	—

APPENDIX VIII

WATER CONSERVATION STATISTICS

Province	*Period*	*Number of dams*	*Aggregate capacity in gallons*	*Average capacity per dam in gallons*
Mashonaland South	1964–65	65	580,000,000	8,923,000
	1963–64	19	57,350,000	3,018,000
Mashonaland North	1964–65	51	375,000,000	7,353,000
	1963–64	83	607,750,000	7,412,000
Midlands	1964–65	47	177,000,000	3,771,090
	1963–64	60	165,500,000	2,758,000
Victoria	1964–65	57	33,000,000	579,000
	1963–64	48	69,650,000	1,451,000
Matabeleland	1964–65	28	2,922,000,000	104,400,000
	1963–64	69	448,850,000	6,505,000
Manicaland	1964–65	60	161,000,000	2,680,000
	1963–64	37	68,610,000	1,854,000
TOTAL	1964–65	308	4,248,000,000	13,792,000
	1963–64	316	1,417,710,000	4,486,000

BY WHOM DAMS WERE CONSTRUCTED

Year	*Farmers and contractors*		*Government units*		*Weirs*		*Total*
	No.	%	No.	%	No.	%	
1964–65	193	62·6	92	29·9	23	7·5	308
1963–64	184	58·2	110	34·8	22	7·0	316

LIST OF CRITICAL FIELD TRIALS CARRIED OUT BY THE DEPARTMENT OF CONSERVATION AND EXTENSION IN 1964–65

Type	*Manicaland*	*Mashonaland North*	*Mashonaland South*	*Matabeleland*	*Midlands*	*Victoria*	*Total*
Maize variety	1	6	1	—	1	1	10
Soya bean variety	1	4	1	—	1	1	8
Cotton variety	1	1	1	1	—	1	5
Cotton fertilizer/spacing	—	3	—	1	—	—	4
Sorghum variety	—	3	—	—	—	—	3
Sorghum silage	1	2	1	—	—	—	4
Liming/maize	3	4	5	—	—	1	13
Vlei drainage	2	—	7	—	—	—	9
TOTAL	9	23	16	2	2	4	56

SPECIAL STATISTICS FOR AFRICAN AREAS: TABLES 1 To 9

TABLE I: NUMBER OF TEST DEMONSTRATION PLOTS

Crop	*Manicaland*	*North Mashonaland*	*South Mashonaland*	*Matabeleland*	*Midlands*	*Victoria*	*Total*
Maize	143	144	123	12	61	97	580
Sorghum	31	23	23	76	69	52	274
Groundnuts	80	58	67	19	11	28	263
Rapoko	14	21	1	—	—	—	36
Munga	29	—	4	8	—	27	68
Cotton	5	29	4	—	10	18	66
Beans	—	1	5	—	—	—	6
Sunnhemp	—	5	—	—	—	—	5
Wheat	—	—	4	—	—	—	4
Nyimo	—	1	1	15	—	—	17
Cowpeas	—	1	—	1	—	—	2
Rice (Paddy)	—	—	—	—	0	—	0
Soya beans	4	5	11	—	8	—	28
Sunflowers	2	1	1	—	—	—	4
Sweet potatoes	—	—	—	—	—	—	—
Potatoes	—	18	—	—	—	—	18
Velvet beans	—	—	—	—	—	—	—
Burley tobacco	2	3	1	—	—	—	6
Oriental tobacco	1	1	—	—	—	—	2
Peas	—	—	—	—	—	—	—
Sesame	1	—	—	—	—	—	1
Pumpkins	—	3	—	—	—	—	3
TOTALS	312	314	245	131	159	222	1,383

TABLE 2: TEST DEMONSTRATION PLOT YIELD RESULTS DURING 1964–65 SEASON

CROP	Total acreage	MANICALAND			MASHONALAND NORTH			MASHONALAND SOUTH			MATABELELAND			MIDLANDS			VICTORIA		
		Acreage	Mean yield in bags/acre	Best yield in bags/acre	Acreage	Mean yield in bags/acre	Best yield in bags/acre	Acreage	Mean yield in bags/acre	Best yield in bags/acre	Acreage	Mean yield in bags/acre	Best yield in bags/acre	Acreage	Mean yield in bags/acre	Best yield in bags/acre	Acreage	Mean yield in bags/acre	Best yield in bags/acre
Maize	1,674	884	5·7	33	149	17·9	40	348	9·5	33	36	2·9	20·8	145	2·3	16	112	3·5	19
Groundnuts	641	352	2·9	11	58	5·5	14	164	2·2	10	19	3·5	4·0	11	2·2	9	37	1·3	10
Rapoko	50	28	3·6	12	21	6·1	14	1	N/A	10	—	—	—	—	—	—	—	—	—
Munga	102	54	3·4	10	—	—	—	10	3·0	7	—	—	—	—	—	—	38	2·0	9
Grain sorghum	413	124	4·5	18	23	11·2	21	45	5·2	24	83	4·7	17	74	3·2	18	64	3·0	14
Cotton (lb. of s.c.)	75	5	787	1,280	29	1,169	2,400	5	851	1,264	—	—	—	10	1,130	1,820	26	483	1,186
Beans	5½	—	—	—	2	2·0	2	3·5	1·4	5	—	—	—	—	—	—	—	—	—
Sunnhemp					As a green manure only														
Wheat	5	—	—	—	—	—	—	5	3·6	14	—	—	—	—	—	—	—	—	—
Nyimo	17	—	—	—	1	7·5	7½	1	1·2	1·2	15	0·3	—	—	—	—	—	—	—
Cowpeas	2	—	—	—	1	2·0	2	—	—	—	1	0·4	0·6	—	—	—	—	—	—
Paddy rice (in bags of 50 lb.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Soyas	28	4	3·8	7·5	5	6·9	12	11	0·9	4	—	—	—	8	No yield		—	—	—
Sunflowers	6	4	3·2	6	1	4·5	4½	1	7·0	7·0	—	—	—	—	—	—	—	—	—
Sweet potatoes	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Potatoes (in bags of 150 lb.)	18	—	—	—	18	42·6	92	—	—	—	—	—	—	—	—	—	—	—	—
Velvet beans	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Burley (lb.)	6½	2	1,345	1,580	4	1,240	1,460	0·5	1,600	1,800	—	—	—	—	—	—	—	—	—
Oriental (lb.)	2	1	820	820	1	720	720	—	—	—	—	—	—	—	—	—	—	—	—
Peas	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sesame	1	1	1·4	1·4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Pumpkins (tons)	3	—	—	—	3	3·2	5	—	—	—	—	—	—	—	—	—	—	—	—
TOTAL ACREAGE	3,049	1,459	—	—	316	—	—	595	—	—	154	—	—	248	—	—	277	—	—

TABLE 3: CROP HUSBANDRY EXTENSION

Details	*Manica-land*	*North Mashona-land*	*South Mashona-land*	*Matabele-land*	*Mid-lands*	*Victoria*	*Total*
Seed Distributed in 200 lb. bags (groundnuts 180 lb.)							
Hybrid Maize	21	51	75·6	25·2	17	7·3	197·1
Open-Poll Maize	1·5	—	—	29·4	—	6·8	37·7
Groundnuts	42·5	1	32	7·6	—	0·5	83·6
Wheat	—	—	3	—	—	—	3·0
Beans (sugar)	—	—	25	—	—	—	25·0
Soya beans	—	2	13	—	—	—	15·0
Sorghum	17·5	1·5	5·5	19·3	—	10·5	54·3
Potatoes (150 lb.)	—	3	—	—	—	—	3·0
Cotton (lb.)	—	345	2,050	—	—	200	2,595
Seed Treatment							
Seed treated (lb.)							
Groundnuts	7	90	1,200	872	1,400	100	3,669
Maize	3	—	1,800	—	2,900	—	4,703
Soya beans	—	—	1,200	—	—	—	1,200
Cotton	—	—	850	—	200	—	1,050
Sorghum	—	—	—	—	100	—	100
Fertilizer Distributed (bags of 125 lb. except Gypsum of 100 lb.)							
Compound D	201	N/A	401	102·4	150·4	69	923·8
Compound M	—	N/A	18	—	—	—	18·0
Compound P	101	N/A	47	91·8	32	354	625·8
Compound S	15	N/A	—	—	9·6	—	24·6
Compound V	—	N/A	3	—	—	—	3·0
Calcium Amm. Nitrate	245	N/A	391	88	72·8	298	1,094·8
Sulphate of Ammonia	74	N/A	—	—	—	—	74·0
Urea	—	N/A	13	72	—	—	85·0
Double Super Phosphate	—	N/A	—	—	—	65	65·0
Raw Rock Phosphate	—	N/A	10	—	—	—	10·0
Gypsum	245	N/A	26	—	—	8	279·0
Others not specified	—	N/A	90	24	—	—	114·0
Lime (tons short)	23·5	N/A	27	—	—	49	99·5
TOTALS (bags)	881	848	999	378·2	264.8	794	4,165·0

TABLE 4: RECORD OF GENERAL EXTENSION WORK

	North Mashona-land	*South Mashona-land*	*Matabele-land*	*Mid-lands*	*Victoria*	*Manica-land*	*Total*
1. Number of plotholders	1,148	1,565	1,468	2,234	3,276	1,369	11,060
2. Number of master farmers	1,572	3,603	747	1,774	5,786	1,144	14,626
3. Number of co-operators	8,359	21,070	7,559	19,364	30,581	21,846	108,779
4. Total number of cultivators	57,850	86,412	76,133	78,798	83,595	80,098	462,886
5. Established number of farm carts in use	3,746	9,607	6,208	5,914	8,501	5,539	39,515
6. Number of farmers using fertilizer	3,860	4,327	1,355	2,241	5,163	3,623	20,569
7. Number of farmers' days	216	695	216	509	914	559	3,109
8. Number of agricultural shows	3	2	3	6	11	—	25

TABLE 5: ANIMAL HUSBANDRY EXTENSION

Province	No. of bulls selected		Bulls from breeding stations		Supplementary feeding		Vlei improvement		Dosing	
	Year	Total	Sold	Loaned	No. making silage	No. making hay	Year acres	Total acres	No. of sheep dosed	No. of cattle dosed
Mashonaland North	—	208	—	—	72	189	—	—	14	60
Mashonaland South	15	98	4	2	135	1,095	—	—	30	1,069
Manicaland	4	4	—	—	105	1,261	—	—	45	814
Midlands	35	35	2	—	264	110	5	5	1,010	7,548
Matabeleland	122	256	31	—	141	420	—	—	9,458	6,543
Victoria	565	4,848	8	—	945	7,724	—	310	4,152	11,359
TOTAL	741	5,449	45	2	1,662	10,763	5	315	14,709	27,303

TABLE 6: GRAZING MANAGEMENT EXTENSION

Province	Acreage managed
Mashonaland North	—
Mashonaland South	71,678
Matabeleland	82,513
Midlands	4,636
Victoria	218,227
Manicaland	1,014
TOTAL	378,068

APPENDIX X (*continued*)

TABLE 7: PURCHASE AREA EXTENSION

Province	Total acreage	No. of farms alienated	No. of I.C.A.s	No. of F.A.s	E.O.s.		E.A.s.		Farm plans prepared	Farm plans implemented	Farms protected	Farms with grazing management
					F.T.	P.T.	F.T.	P.T.				
Mashonaland North	1,787,340	1,355	12	5	4	4	26	—	—	—	1,140	130
Mashonaland South	443,530	1,386	14	1	6	4	24	—	4	—	337	388
Matabeleland	339,395	890	4	2	2	7	15	5	1	—	249	41
Midlands	1,040,655	1,375	4	N.R.	3	8	35	—	5	—	725	35
Victoria	749,379	1,958	18	1	5	2	48	3	—	1	621	103
Manicaland	250,097	1,296	12	N.R.	3	6	24	5	6	3	1,042	235
TOTALS	4,610,396	8,260	64	9	23	31	172	13	16	4	4,114	932

F.T.=Full-time. P.T.=Part-time.

TABLE 8 (*a*): TRAINING

Training establishment or venue	*Course title/description*	*Length of course (days) and number of courses*	*Number of participants*	
			Conex	*Others*
Alvord Training Institute	Advanced Conservation	12 (1)	29	—
	Chiefs' Conservation Conference	3 (2)	9	61
	Co-operative Society Officers	5 (2)	—	42
	Crop Survey	3 (11)	105	11
	Effective Supervision	3 (1)	8	2
	Extension Assistant Intake	42 (1)	67	—
	Extension Methods	19 (3)	28	—
	Extension Refresher	1 (5)	98	—
	Field Days	11 (4)	3	86
	Group Identification	3 (1)	10	—
	Home Economics Seminar	1 (1)	1	20
	Irrigation	10 (1)	22	—
	Livestock	1 (1)	22	—
	P.O. Assistants	5 (1)	21	—
	Sheep and Goats	3 (2)	25	—
	Teachers' Conservation Course	5 (5)	17	104
	Teachers' Seminar	1 (2)	18	31
	Teacher Trainee Course	4 (1)	—	28
	Veld and Pasture	4 (1)	12	1
	"What Is Extension? "	1 (4)	—	141
	Women's Club leadership	5 (4)	—	94
	Women's Voluntary Leadership	12 (2)	—	48
	Young Farmers' Club Leadership	4 (1)	9	17
	Youth Extension	3 (2)	48	7
	Zumba Students' Association	1 (1)	—	100
Domboshawa Training Institute	Chiefs' Conservation Conference	4 (5)	—	195
	Extension Assistant Intake	30 (1)	27	—
	Extension Methods	12 (2)	38	—
	Field Days	1 (1)	—	100
	Home Demonstration	3 (1)	—	14
	Shona	12 (1)	11	—
Kayisa Training Institute	Agronomy	4 (1)	12	—
	Beekeeping	1 (1)	—	6
	Chiefs' Conservation Conference	3 (2)	—	70
	Co-operative Societies Conference	3 (1)	—	22
	Effective Supervision	3 (1)	15	—
	Extension Assistant Intake	133 (1)	34	—
	Extension Refresher	4 (1)	43	—
	Extension Refresher	5 (1)	14	—
	Farm Visits	5 (1)	12	—
	Field Days	1 (1)	—	35
	Teachers' Conservation Course	3 (1)	4	30
Msengesi Training Institute	Extension Assistant Intake	72 (1)	60	—
Rowa Regional Centre	Chiefs' Conservation Conference	4 (1)	16	20
	Cotton	1 (1)	15	—
	Extension Assistant Intake	28 (1)	22	—
Not included in the above but recorded by various provinces is the training listed hereunder				
Manicaland	Horticulture	2 (1)	8	—
Matabeleland	Grain Marketing Board	1 (2)	19	—
	Horticulture	1 (4)	33	—
	Land Measurement	1 (4)	13	—
	Oriental Tobacco	5 (1)	16	—
	Soil Conservation	1 (7)	29	—
Victoria	Agronomy	3 (5)	83	—
	Animal Husbandry	3 (5)	83	—
	Grain Marketing Board	1 (1)	13	—
	Oriental Tobacco	5 (1)	76	—
	Programme Planning	2 (3)	30	—

SUMMARY: 121 courses.
4·2 days average duration.
2,563 total participants.
(1,278 Conex—1,285 others).

TABLE 8 (*b*): MASTER FARMER TRAINING

Province	*Number of farmers' training centres*	*Number of farmers attending master farmers' training centres*	*Other training provided, and use of centres for community activities*
Mashonaland North . .	82	1452	Y.F.C. Women's Clubs.
Mashonaland South . .	130	1706	Y.F.C. Women's Clubs. I.C.A. Meetings. 16 Field Days.
Manicaland	66 (16 burnt)	5751	Women's Clubs.
Victoria	158	3379	Livestock Clubs. Master Farmer Clubs. Women's Clubs. Interest Groups. Chiefs' Meetings. Farmers' Association. Agricultural Loan Fund Meeting.
Midlands	95	2067	
Matabeleland	78	1213	Women's Clubs. Co-op. Society.
	609	15,568	

Name of settlement		Nyamaropa			Mutema			Tawona			Maranke	
Number of plotholders		250			122			120			188	
Acreage under irrigation		650			416			432			844	
Acreage cropped		860·5			714·5			735·5			1,077	
Crop	Unit of measurement	Acreage	Total yield	Average per acre	Acreage	Total yield	Average per acre	Acreage	Total yield	Average per acre	Acreage	Total yield
Maize	200-lb. bag	150	1,800	12	273	2,401	8·8	216	3,651	12·2	654·5	3,699
Wheat	200-lb. bags	55	275	5	60	120	2	52	234	4·5	202	414
Beans (ration)	200-lb. bags	8	56	7	137	685	5	151	755	5	49	86
Beans (seed)	200-lb. bags	342	1,556	4·5	99	495	5	94·5	567	6	6·75	25
Beans (Sunrho)	tons	—	—	—	—	—	—	—	—	—	—	—
Sorghum	200-lb. bags	—	—	—	10·5	49	4·6	4	24	6	4	9
Millet (Munga)	200-lb. bags	—	—	—	75·5	422	5·6	172·5	1,129	6·5	3	7
Peas (seed)	112-lb. bags	—	—	—	—	—	—	—	—	—	6	57
Peas (dried)	112-lb. bags	13	182	14	—	—	—	—	—	—	—	—
Cotton	tons	283	329	1·16	48·5	4·9	1	36	28·2	0·8	—	—
Burley tobacco	lb.	4·5	3,604	1,245	1	2,270	2,270	—	—	—	1·25	1,381
Burley tobacco	value	—	£565	£125	—	£204	£204	—	—	—	—	£82
Garlic	—	4	—	—	—	—	—	—	—	—	—	—
Tomatoes (seed)	lb.	—	—	—	5	375	75	—	—	—	3	—
Tomatoes (fresh)	tons	—	—	—	—	—	—	—	—	—	74	296
Lettuce (seed)	lb.	1	300	300	4	200	50	8	4,000	500	—	—
Other	—	1	—	—	1	—	—	1·5	—	—	73·5	—
	TOTAL	860·5	—	—	714·5	—	—	735·5	—	—	1,077	—

TABLE 9.—CROP RETURNS FROM IRRIGATION SCHEMES IN TRIBAL TRUST LANDS, 1964–65

	Chibuwe			Umvumvumvu			Nyanyadzi			Mutambara			Devuli		
	267			72			288			119			156		
	999			242			894			300			539		
	193·1			374·25			1,610·75			500·5			544		
Average per acre	Acreage	Total yield	Average per acre	Acreage	Total yield	Average per acre	Acreage	Total Yield	Average per acre	Acreage	Total yield	Average per acre	Acreage	Total yield	Average per acre
5·6	721	8,834	12·3	97	932	9·6	604	4,921	8·1	226	2,373	10·5	326	4,890	15
2	184	993	5·4	41	164	4·0	310	1,860	6·0	90	450	5	—	—	—
1·7	639	3,643	5·7	26	130	5·0	106	725	6·8	7	28	4	—	—	—
3·7	122	643	5·2	33·5	70	2·25	244	1,285	5·25	3·5	10·5	3	7	10	1·4
—	—	—	—	—	—	—	60	152	2·5	—	—	—	—	—	—
2·25	24	118	5	5	27	5·4	23·5	113	4·8	—	—	—	55	275	5
2·33	—	—	—	9	41·5	4·6	11	49	4·4	—	—	—	24	108	4·5
9·4	—	—	—	—	—	—	—	—	—	62	609	9·9	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	148·5	136	0·9	73·5	90	1·25	218·5	262	1·2	33·5	22·7	0·7	120·5	133	1·1
104	9	12,820	1,424	3	4,168	1,390	7·75	14,038	1,808	13·5	20,367	1,508	—	—	—
£65	—	£885	£98	—	£281	£94	—	£118	£118	—	£1,892	£140	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	4·25	—	—	9·5	—	—	—	—	—	—	—	—
4	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	10	4,000	400	21	—	—	5·5	—	—	2	800	400	—	—	—
—	72·5	—	—	59	—	—	11	—	—	53	—	—	11·5	—	—
—	1,931	—	—	374·25	—	—	1,610·75			500·5			544		

Nyachowa			Murimbinda			Shashi			Zimapi			Total		
32			22			81			19			1,736		
114			86			164			22			5,692		
181			130·25			254			42			8,955		
age	Total yield	Average per acre	Acreage	Total yield	Average per acre	Acreage	Total yield	Average per acre	Acreage	Total yield	Average per acre	Acreage	Total yield	Average per acre
	630	6·5	46	460	10	162	4,050	25	—	—	—	3,573	38,641	10·8
	180	3	44	44	10	90	1,530	17	18	108	6	1,207	6,768	5·6
	—	—	7	42	6	—	—	—	—	—	—	1,130	6,150	5·4
	—	—	—	—	—	—	—	—	—	—	—	952·25	4,661	5·0
	—	—	—	—	—	—	—	—	—	—	—	60	152	2·5
	—	—	1	17	17	—	—	—	—	—	—	127	632	5·0
	—	—	—	—	—	—	—	—	—	—	—	295	1,756	6·0
	—	—	—	—	—	—	—	—	—	—	—	68	666	9·5
	—	—	—	—	—	—	—	—	—	—	—	13	182	14·0
	—	—	16	21	1·3	—	—	—	—	—	—	978	1,026·8	1·05
	—	—	5·75	6,553	124	—	—	—	—	—	—	45·25	67,201	1,485
	—	—	—	£678	£110	—	—	—	—	—	—	—	£5,505	£121–13
	—	—	—	—	—	—	—	—	—	—	—	4	—	—
	—	—	—	—	—	—	—	—	—	—	—	21·75	—	—
	—	—	—	—	—	—	—	—	—	—	—	75	—	—
	400	400	—	—	—	—	—	—	—	—	—	62·5	—	—
	—	—	11	—	—	2	—	—	12	—	—	331	—	—
			130·25	—	—	254	—	—	30	—	—	8,941	—	—

ANALYSIS OF HOURS

	Mashonaland North	Mashonaland South	Manicaland	Midlands	Victoria	Matabeleland	Totals	Grand Total	Percentage
I.C.A. Group: Farmers	3,370	3,140	2,241	2,850	2,518	2,080	16,199	66,093	16·0
Staff Conferences	2,881	3,008	2,038	4,374	3,697	3,391	19,390		
Courses	6,428	5,060	3,751	5,150	5,720	4,395	30,504		
Inspections	2,899	2,989	4,264	1,741	1,778	3,299	16,970	16,970	4·1
Agronomy	4,843	5,122	10,820	3,521	4,842	8,371	37,519	151,205	36·7
Tobacco	3,776	2,373	3,548	3,011	2,060	1,938	16,706		
Livestock	1,307	3,110	2,349	4,559	5,249	6,534	23,108		
Soil and Water Conservation	9,959	9,267	4,227	4,128	3,829	4,987	36,397		
Irrigation	1,278	1,305	3,941	1,761	3,274	9,890	21,449		
Farm Planning	4,317	2,633	1,694	2,207	812	1,123	12,786		
Farm Management	759	556	492	287	725	421	3,240		
Field Days, Shows	3,514	3,080	2,271	1,526	1,397	1,418	13,206	53,012	12·9
Field Trials	2,985	2,618	2,173	1,660	2,189	2,870	14,495		
Census	712	373	193	267	339	607	2,491		
General Extension Liaison	2,717	4,027	5,331	5,232	3,412	2,101	22,820		
Administration	11,898	11,013	7,526	11,593	9,047	11,795	62,872	67,728	16·5
Publications	903	1,980	411	847	192	523	4,856		
Travel Time	8,814	7,173	8,300	11,051	9,533	11,045	55,916	55,916	13·8
TOTAL	73,360	68,827	65,570	65,765	60,613	76,788	410,923		100

Department of Veterinary Services Report

for the period 1st October, 1964, to 30th September, 1965

STAFF

Recruiting drives abroad supported by the recent raising of the salary structure have slightly improved the professional staff position.

Veterinary Surgeons—Establishment 40

	At 30.9.64	*At* 30.9.65
Permanent terms establishment	18	26
Provisional terms establishment	7	5
Contract terms establishment	4	3
Total staff	29	34
Total vacancies	11	6

Entomologists—Establishment 15: *Vacancies* 4

Two of the veterinary vacancies have been awarded to officers who will join shortly and two more are on offer to interested individuals.

The intake of officers qualifying under the Government Bursary Scheme should be about 15 in the years 1967–70, provided they all elect to return to Government service, but this will just about meet normal retirements, wastages, etc.

With the expansion of beef exports, the posting of four permanent veterinary surgeons to supervise the abattoirs, as demanded by the importing countries, has created a further need for an increase in establishment.

Provision of decentralized veterinary investigational centres in the five provinces, with attached mobile laboratories, is an urgent necessity that will have to be met in the future with more staff.

The reorientation of recruits to the necessity for specialized application in the subjects of preventative medicine and epizootiology, animal husbandry and physiology, including nutrition, animal reproduction and the very vital applied aspects of environmental physiology is a time-consuming factor; and every step must be taken to retain them after this initial costly induction. The acceptance by Government of study for post-graduate degrees as an essential part of staff training on a fully paid duty basis must be applauded as a measure that will facilitate this reorientation and retain the services and enthusiasm of the staff thereby materially increasing its efficient worth to the livestock industry. One member of the staff is already studying for his Diploma of Public Health (Veterinary) at Onderstepoort under these terms.

The training of lay-staff, European and African, as a primary basic support to the professional services has been markedly expanded but the provision of a central school for this purpose with a permanent professional training staff is necessary.

A special study of the methodology of veterinary extension services in Tribal Trust Lands and African Purchase Areas has been actively pursued by our first African veterinary surgeon.

This has clearly shown the gains that could be won in the national herd economy in such areas by veterinary surgeons attuned to the correct psychological approach in extension services to African owners of stock.

With 2,200,000 of our total of 3,800,000 cattle under African ownership any permanent increase in the turn-over in the cattle industry can only be guaranteed by acceptable intensive promotion of effective animal health prophylactic measures within African areas giving an increased take-off.

Cattle sales in all African areas in 1964–65 yielded only 4·72 per cent. of the total herd, largely due to Mashonaland, Midlands and Manicaland yielding a mere 1·44 per cent. sales from one-third of the total African cattle. The increased demand for feeders for beef production cannot be met unless this stock yield from African areas is at least doubled.

The ever-increasing number of small domestic stock (sheep, goats, pigs and poultry) in these areas must also be fostered in its health aspect and channelled to a higher productivity.

The prospects of lay staff were slightly improved in salary structure in the animal health inspectorate and wastage was nearly halved, but that of tsetse field officers has as yet to be resolved satisfactorily.

Meat inspection staff has been maintained at an efficient level only by re-employment of pensioners, and the future holding of staff is questionable unless salary grades are improved.

LIVESTOCK ECONOMY

Cattle

Continued drought played havoc with water supplies and this has been the major problem in many areas with a considerable drop in the water table in the middle and lowveld especially. Active promotion of canal and pipe conveyance of water to strategic points for the watering of cattle holds hope for the future but in the major lowveld areas stock have only survived by their diminution in number.

In the 1963–64 drought, 70,200 head died and removals by sales were approximately 30,000 head in both 1963–64 and 1964–65. Poverty was again apparent in some lowveld areas at the end of this agricultural year but, if good early rains eventuate, the death rate should not be as large as in 1963–64.

The practice of milling of young shoots of selected veld bush, with urea supplementation, for winter feed in lowveld ranches has saved several herds and is on the increase.

Elsewhere the optimistic attitude in regard to beef production has been marked but a certain fringe of ranchers in the marginal areas are not venturing on expansion unless a marked increase in slaughter prices can be obtained. Beef bulls, steers and even heifers of the exotic beef type have doubled and even trebled in price in the areas now turning to high-energy feeding with far reaching consequences in all aspects of beef production. Stall feeding of three to four year old bullocks in the sugar production areas is fast increasing and the need for another abattoir is now very apparent and immediate if we are to be able to handle all slaughter animals on offer as export potential in the near future. The dairying industry continued in a depressed state of over-production.

Sheep and Goats

With importation of mutton still continuing, the prospects for this class of animal are good. Despite enthusiastic promotion, however, few people will adopt sheep as a main production due to the constant need for a high standard of management and efficient internal parasite control.

Pigs

Production has stabilized in the European areas and the sporadic producers of pigs are disappearing. A deeper interest in producing the right type of pig is generally apparent, ably fostered by the modern approach in progeny testing now offered by the Pig Industry Board.

Poultry

The takeover of this industry by the larger concerns proceeds apace, and the opening of a dressing and packing co-operative plant in Salisbury underlined this development. The production of day-old chicks and broilers is creating a demand for export markets that have been hard to find.

GENERAL

With drought losses and poor condition the past average annual increase in stock populations and export slaughterings was not maintained and there was only a token increase in both respects. Fertility in general was poor and store stock are bound to be in low supply for at least the next two to three years.

The sale of long weaners, approximately 15 months of age, to high-energy feeders by middle and lowveld ranchers instead of running them on to grass-finished slaughter bullocks of three to four years of age will relieve grazing pressure and may give a compensatory rise in conception rates in the remaining breeding herds to offset this shortage.

The early weaning of calves with the simultaneous supply of high-energy rations to their dams has proven a potent factor in the raising of conception rates and the high prices now being paid for weaners should economically justify a wider adoption of this practice on the better managed ranches.

In African areas civil disobedience and obstructionism was firmly handled and, with the removal of intimidators, collapsed. The restoration of normal co-operation between stock owners and our staff was rapid and effective. The end result of this past non-co-operation has been evident in marked increases in Rabies, Trypanosomiasis and tick-borne diseases in African areas and the lesson seems to have been learned and appreciated in the affected areas.

The whole country was gazetted as a compulsory dipping area throughout the year to deal with the hitherto unsuspected rise of brown ticks in early July as demonstrated in wide-spread tick surveys. Our increasing Theileriosis incidence has been proved to be mainly *Theileria mutans*, and not *Th. lawrencei* as heretofore accepted, and the precipitating factor was a tick toxicosis following on early brown tick infestations. It was immediately evident that the wide-spread winter practice of non-dipping had to be stopped

if this type of Theileriosis was to be effectively controlled by the dipping out of brown ticks as larvae and nymphs in July. In addition, sustained winter dipping has proven itself as an effective insurance against massive infestations in the peak tick periods of summer when effective dipping is often invalidated by continuous rains, and its universal adoption is fully justified.

Unfortunately dipping is repeatedly made impossible in winter by water shortages and in Tribal Trust Lands is often delayed until January. This again stresses the necessity of overall water conservation and distribution throughout the country as an urgent necessity.

The vital part played by the game fences erected and maintained by the department as a disease control measure was fully proven this past 18 months when foot and mouth disease in Moçambique was present along our south-eastern border. Heretofore spread of such infection into our south-eastern lowveld had been automatic, but the fence proved a completely effective barrier.

The cost of such fences compared to the cost of outbreaks of disease and the disruption of orderly cattle marketing is negligible.

Recent surveys of prophylactic measures being practised by European cattle owners underlined the wasteful neglect of stock where they are secondary to crop production etc.

Number of farms	*Number of cattle*	*Regular quarter evil vaccination*	*Regular contagious abortion heifer vaccination*	*Sustained internal parasite treatment*
635	Over 100	83·15%	39·0%	80·35%
140	50 to 100	57·85%	22·14%	50·71%
224	Less than 50	35·26%	13·83%	30·4%

Much more information has been obtained but this still is to be summarized.
Similar surveys will be promoted throughout the country.

Tick life and Dipping

Widespread lack of essential water supplies has severely interfered with adequate tick control and only the existing low level of challenge brought about by efficient past control has avoided major outbreaks of tick-borne disease. Some areas only dipped from January to June and the potential of build-ups of ticks therein are great. Marked abuse of the privilege of hand-spraying led to its severe restriction.

The swing from arsenic has been marked and pressure groups for its abolition as an acaricide are mounting. Toxaphene has replaced it in many European areas but the most popular combination in general use is the phosphatic-arsenic one in plunge dips.

Heavy pressure is also being exerted to abandon the use of arsenical preparations in the Tribal Trust Lands because of an increasing tolerance to arsenic. Such a step would entail an extra cost of at least £125,000 and is unacceptable in the present situation. Internal Affairs have somewhat reduced present costs by delegating dipping to local councils. Consequential efficiency is extremely variable.

Quarantine notices in respect of tick infestation reflected the increased attention that has had to be paid to control.

Quarantine notices	*European properties*	*African areas*	*Total*
1963–64	917	598	1,515
1964–65	921	718	1,639

The contraventions in respect of which prosecutions were instigated successfully reached a total of 4,168.

Livestock Inspections

A total of 19,760,000 cattle inspections in the year underlines the intensive routine that has to be maintained in satisfying the level of disease control demanded by the importers of our animal products. It represents the total cattle population being individually inspected at least four times per year.

DISEASE FACTORS

Foot and Mouth Disease

Early in June, 1965, infection was once again confirmed on Liebig's Ranch, Beitbridge, being typed as SAT II. This outbreak followed on Wild Life cropping operations in the immediate area and little doubt exists that infection was derived from this source. The 1964 outbreak on this ranch arose when fully

susceptible weaners shared a common water source with game that had shown infection in 1962, and this outbreak followed on cattle grazing veld where game had been shot, eviscerated, then dressed at a local camp. The opportunity was seized to import buffalo, wildebeest and impala for a controlled transmission experiment, which unfortunately could only be on a short-term basis to coincide with regulatory control measures.

The full significance of the end results cannot as yet be given as all sera test results have not been fully assessed. Summation to date reveals that six wildebeest, four buffalo and five impala were infected with a 1 in 10 concentration of natural virus either by intralingual or intramuscular injection on the infected place in isolation from any cattle contact, their sera being negative to complement fixation test before infection with the exception of one buffalo which was immediately killed. Tongue and gum traumas were so marked in these animals previous to experimentation that great difficulty was found in accurate observations for mouth lesions.

In the wildebeest only one showed a slight transient rise in temperature on the fourth day but no lesions were observed. Two only showed a rise in the complement fixation test to 1/64. Only two of the three buffalo could be temperatured and neither showed any rise. One animal showed a suspicious gum lesion and one a definite hind hoof vesiculation.

The five impala died from exposure due to their necessary confinement in small pens to avoid self-injury. Obviously these animals cannot stand close confinement. Complement fixation tests were all negative.

Buffalo gave two positive sera tests in the three survivors, one rising to 1/1024, the other to 1/512, peak being reached on 20th day after infection but rapidly falling thereafter. The reactor at the 1/1024 level had fallen to 1/256 by the 43rd day, when the experiment had to be necessarily concluded.

Natural traumatic lesions in buffalo.

Sera from the buffalo showing infection, from the reacting wildebeest and from an infected bovine were separately passaged through proven susceptible bovines and all bovines reacted with peak titres at the 14th day with the highest at 1/1024 in the bovine infected from the buffalo, 1/708 in the bovine infected from a bovine and only 1/90 in the bovine infected from the wildebeest.

It was unfortunate that the experimental animals had to be slaughtered as further sera samples would have given a lead to the evaluation of the sporadic positive titres which Pirbright have reported in previous submitted samples from free-living wild life, especially in view of the rapid drop in titres in buffalo and wildebeest and the marked difference in levels in the two species.

Similar work will be pursued as the occasion arises.

With regard to the cattle infection on the ranch it was found to be confined to one small block on the west with a marginal minor spread into Tribal Trust lands at the north-east.

Both were securely cordoned and aphthised. Surrounding areas were drought stricken and it was obvious that the customary short-term inspection of cattle in the adjoining quarantine areas could not be applied without—

(*a*) severe casualties in stock forcibly trekked to inspection points;

(*b*) non-production of stock under these circumstances; and

(*c*) deliberate spreading of disease to terminate short term inspections.

It was therefore decided to vaccinate the adjoining quarantine areas with a modified foot and mouth vaccine, S.A.T. II Rho 1, vaccination being employed for the first time in Rhodesia.

One small breakdown was observed in vaccinated cattle grazing on the south edge of the infected centre with a few atypical lesions and only two typical lesions but no further spread occurred at these centres. Vaccination of all small stock plus revaccination of the cattle gave complete control thereafter.

In the infected centres, Shobi Block, Liebig's Ranch and Kwalu Dip, Siyoka Tribal Trust Land, a total of 4,119 head were aphthised under cordons.

In the quarantine area a total of 34,157 cattle and 14,005 sheep and goats were vaccinated once, and 20,429 cattle were vaccinated twice, an overall total of 68,591 vaccinations.

Despite the expensive administrative problems of necessarily maintaining the vaccine at −20°C. and the diluent at −10°C. up to the time of actual administration in remote areas it was found to be a very efficient and economic method of control.

It was obvious that the abandonment of aphthisation with its ever-increasing risk of widespread dissemination of disease in the expanding over-stocked Tribal Trust areas was long overdue and this first highly successful vaccination exercise promises well for the future.

All active infection was suppressed within two months of the discovery of infection despite the difficulty of drought conditions, and an effective vaccination blanket superimposed in the quarantine area within six weeks with no spreads of disease. The active co-operation of the African cattle owners in the production of cattle and small stock for vaccination was in marked contrast to their previous antagonism to continuous short-term inspections in non-vaccination programmes of control.

With a welcome gift of 50,000 doses of foot and mouth vaccine we are mounting further trials in a cattle herd at a Government breeding station in a disease-free area to establish the degree of immunity conferred on indigenous stock by—

(*a*) one vaccination; and

(*b*) revaccination at intervals of one, two, three, four and six months.

This will reveal the optimal time for the most lasting "booster" effect of the second vaccination in respect of continued immunity at the highest possible level.

Strategic fencing has been greatly extended, especially in the south-east area, to give greater effective separation of domestic stock and reduce the numbers at risk in the hitherto-accepted foot and mouth prone areas. This also lessened the required scope of continuous short-term inspections and opened up a high potential cattle area on a less onerous scale of regulatory control fully acceptable to our importers of beef.

All foot and mouth control fences have been maintained in good repair except on the south-east Wankie National Park border where large herds of elephants have had to break out to reach the only available water in adjoining Tribal Trust Lands. It is hoped that new boreholes within the park will have solved this problem by the dry season of 1966.

The security of our western border from foot and mouth disease was greatly promoted by the prophylactic vaccination of all Bechuanaland stock with an SAT I and SAT III vaccine, a total of approximately 160,000 head, in August, 1965, in the areas adjoining our border. Unfortunately disease was diagnosed in the last handful of cattle to be vaccinated in the Makarikari Pans on 2nd September, 1965.

Co-operation with the Bechuanaland veterinary authorities secured immediate border control of strays with non-compensatory destruction and incineration of such on both sides and the speedy mutual establishment of border cordons. A further revaccination of the Bechuanaland cattle near our border on the Nata River was then carried out and no spread of this disease occurred thanks to the gracious and effective co-operation of the Bechuanaland Director of Veterinary Services.

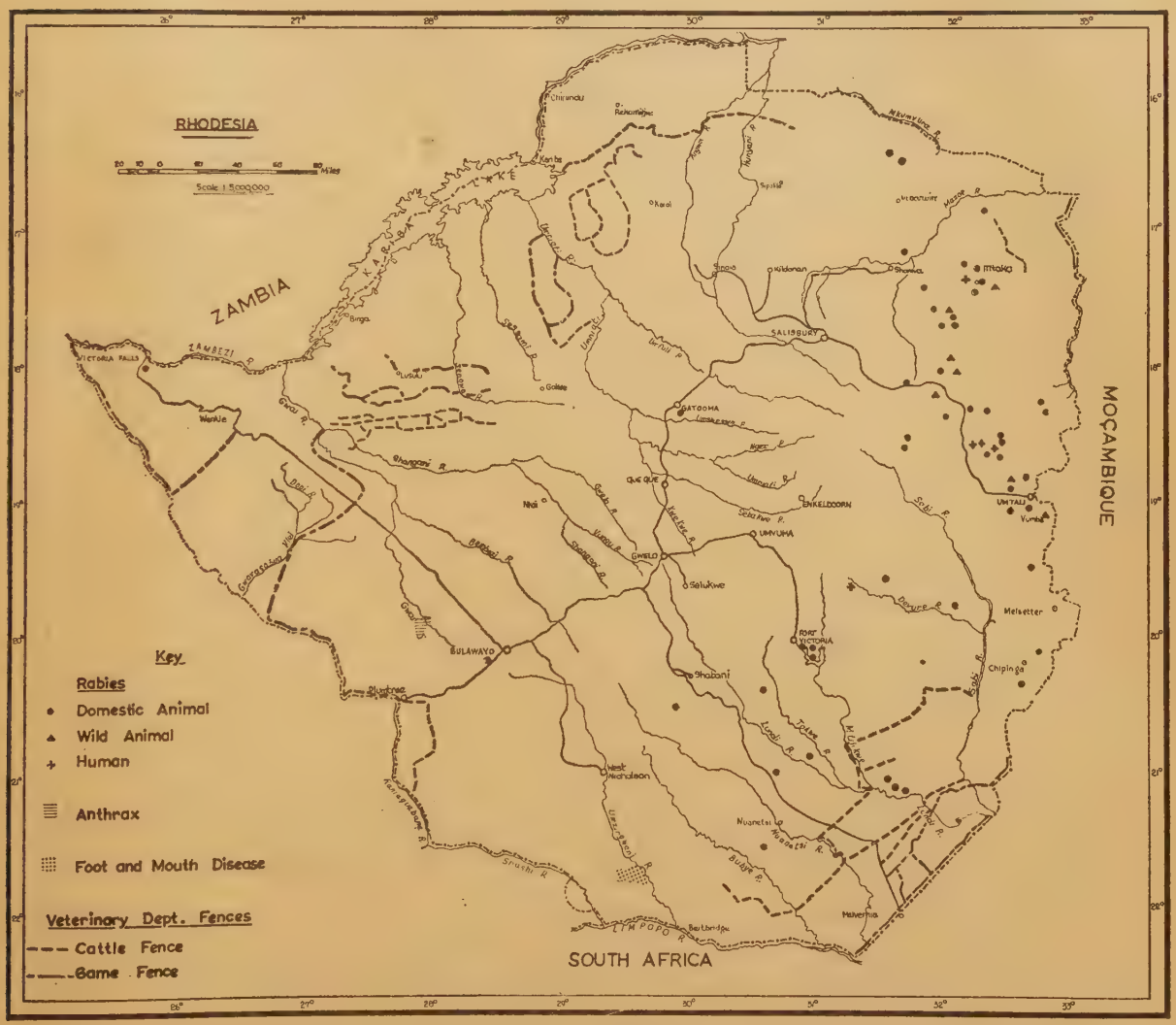
Rabies

With the continuous threat of uncontrolled foci of rabies in the relatively unoccupied portions of the country on our eastern border and our inability to maintain a high cover of vaccination of dogs in adjoining areas as a result of civil disobedience over the past two years, the expected breakdown in control occurred with a marked upsurge in positive cases from an annual average over the last five years of 15 to an alarming total of 63 cases, including five humans.

Positive Cases

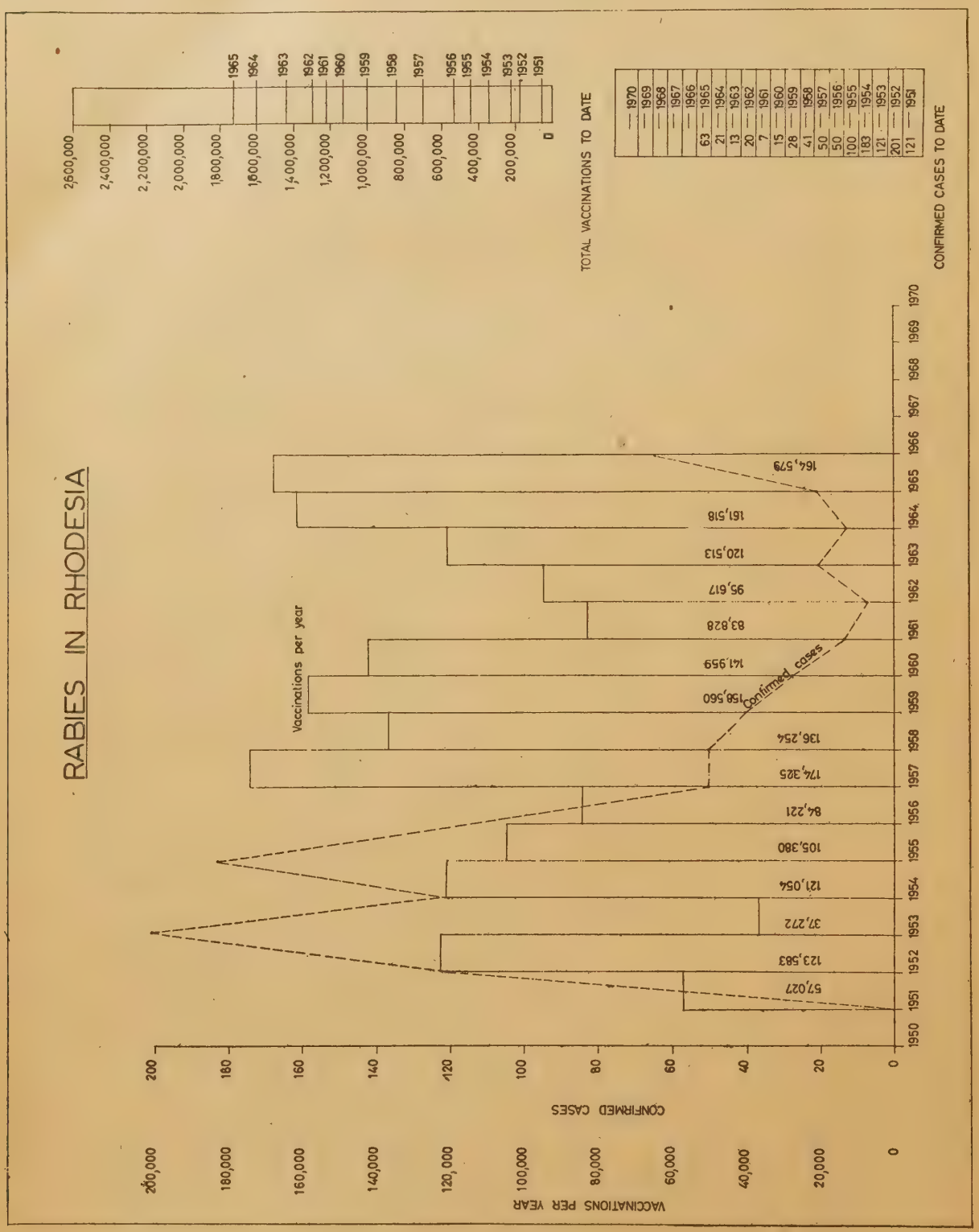
Humans	*Dogs*	*Cats*	*Cattle*	*Jackals*	*Baboons*
5	46	3	2	6	1

Total Specimens Submitted—216



Restoration of civil co-operation in the Tribal Trust areas has enabled us to mount an all-out campaign to regain effective vaccinal cover with a satisfying rise to a total 164,579 dogs inoculated this year and a resultant drop in incidence should now eventuate.

The absence of cases on our western border is linked with the vaccination of dogs now being effected in Bechuanaland and should continue as long as this policy persists.



However, it is of interest to note that the increase in rabies incidence reflects a general world-wide rise. In the U.S.A. it has been recorded that the incidence of animal rabies dropped steadily from 1946 to 1960, but since 1961 this trend has been reversed and there was a 20 per cent. increase in 1964.

Theileriosis

Recent research established that the majority of our outbreaks formerly ascribed to *Theileria lawrencei* were in reality *Th. mutans* supervening on a rhipicephalid tick toxicosis when cattle were heavily parasitized, as previously mentioned, in mid winter.

The enforced policy of compulsory dipping in the winter in Theileriosis-prone areas resulted in a diminution of outbreaks and deaths.

Theileriosis	*Infected premises*	*Deaths*
1963–64	38	248
1964–65	23	134

Following the reported mutation of *Th. lawrencei* to *Th. parva* by multiple passage in susceptible bovines in Kenya, this was fully investigated, with supportive xeno-diagnosis at Onderstepoort, with completely negative results.

Tuberculosis

Bovine

Imports Tested (double comparative)—2,366 Reactors 1.
Exports Tested (double comparative)—474 Reactors Nil.

Meat Inspection Incidence

Generalized Tuberculosis

Total cattle slaughtered—281,626.
Total condemnations—4 (1 in 70,408).
Incidence per cent.—1964–65: 0·0014 (cf. 1963–64: 0·005).

Porcine

Total pigs slaughtered—103,020.
Total pigs condemned—1.
Incidence per cent.—1964–65: 0·0009 (cf. 1963–64: 0·011).

Overall Incidence (generalized and partial condemnations)

Abattoirs	*Cattle total*	*Per cent. incidence* 1964–65	1963–64
Bulawayo	9 in 107,713	0·0083	0·021
Salisbury	7 in 110,013	0·0063	0·012
Fort Victoria	3 in 54,400	0·0055	0·032
Umtali	Nil in 9,500	—	—
Totals	19 in 281,626	0·0067	0·015

No attempt has been made to assess the percentage incidence of infection in pigs as the majority of the tuberculosis-like lesions found in the lymph nodes of the head in pigs has been shown to be due to other organisms than tuberculosis.

Avian

Avian tuberculosis is a rarity, having only been confirmed in two cases in 1963–64.

A recent random survey of 38 commercial flocks for tuberculosis, employing the rapid agglutination test with antigen produced in Germany, gave completely negative results.

Dairy Herds

The majority of the commercial herds (comprising approximately 45 per cent. of total dairy stock) have reached attested status, but a hard core of dairymen still retain untested herds and will continue to do so until there is a financial gain from producing tuberculin-tested milk. We are attempting to retain attestation on a biennial test basis but shortage of staff has impeded strict adherence to this policy.

Tuberculin Tests 1964–65

Herds	*Cattle*	*Reactors*
262	21,588	12

Incidence Percentage		
1962–63	1963–64	1964–65
0·19%	0·24%	0·05%

The generalized fall in tuberculosis incidence over the last five years underlines the very real possibility of a successful eradication scheme.

Anthrax

This was confirmed on a European Ranch in the Nyamandhlovu District and in the Tjolotjo Tribal Trust Lands lying to the north of it. There seems little doubt that disease originated in the Tribal Trust Lands as this area had to be patrolled by plain clothes cattle guards before positive smears could be obtained. At least 50 animals are suspected to have died.

The second compulsory annual vaccination in the control of the Inyati outbreak confirmed in 1963–64 was duly effected.

Control Vaccinations	*Cattle*	*Sheep–Goats*	*Pigs*	*Equines*
Nyamandhlovu	3,042	204	73	106
Tjolotjo T.T.L.	108,938	36,517	153	174
Inyati	710	3,343	—	226
Totals	112,690	37,064	226	506
All Stock	150,486			

Fowl Typhoid

Twelve outbreaks were recorded this year. This growing incidence is linked to the creation of mass units. Persistent reactors to a testing-out exercise in a large hatchery involved some 40,000 tests and over 3,000 post-mortem examinations of birds, with a resultant heavy financial loss to the owners. Permanent supervision by lay and professional staff was provided for a prolonged period to clear up this outbreak and preserve one of our largest exporters in the day-old chick industry.

General

The country remained free of any other major panzootic and no recurrence of African Swine Fever was found in the restocked areas of the Darwin and Gwanda Tribal Trust lands. No Newcastle disease, Fowl Cholera or Bacillary White Diarrhoea occurred, but in view of the recurrent outbreaks of Newcastle disease in adjoining countries it was decided to permit vaccination with an approved dead vaccine to protect valuable parent stock in hatcheries if we were unfortunate enough to sustain an outbreak.

Virus pneumonia in pigs disappeared from the Eastern Districts and, with the liquidation of one particular herd, it is hoped we have seen the last of this disease.

Cases suggestive of virus diarrhoea have occurred in several herds in the Bulawayo and Gwanda area on a sporadic pattern and the situation is being carefully watched.

Aphosphorosis has proved troublesome and not highly amenable to treatment in the Bulawayo province. The resultant botulism and traumatic reticulitis have proved costly wastage factors in cattle. Mineral licks have not been the solution in many areas and it appears that a mineral inbalance and not a straight phosphorus deficiency is the underlying cause which must be investigated in the near future.

With drought conditions and sudden desperate movements of sheep to better grazing, enterotoxaemia has taken more than a heavy toll this year. Moreover it appears that when such marked pre-disposing conditions prevail, then vaccinal cover must be maintained at a very high level to prevent mortality. In some areas, the pattern of events strongly suggests that revaccination at four to six month intervals, under drought conditions, is highly advisable.

The high rise in incidence in goats was remarkable, being tied to their browsing of the spring leaves of bush long before they are available to sheep or cattle. The sudden switch to a high nutritional plane triggered off outbreaks with very intense haemorrhagic enteritis limited to the middle third of the small intestine and surrounded by marked oedema.

Verminosis

Examination of faecal samples in district offices is now mounting in intensity with a more widespread pattern of regular dosing resulting therefrom. Much of the benefit derived from such dosing is, however, completely negated by the inability to move herds and flocks to new pastures largely due to lack of multiple watering points and efficient paddocking.

Toxic Factors

Mineral and Organic

There has been a welcome drop in the deaths from poisonings by acaricides, pesticides, fertilizers, etc., arsenic fatalities falling to 564 compared to 802 in 1963–64. Farmers in general are showing greater

care in the security control of poisonous substances following the intense campaign carried out by animal health inspectors on this necessity.

PLANT POISONING

Intensive and prolonged investigations into toxic plants have been carried out at Bulawayo and Que Que with minor checks in the Sinoia area, ably supported by the Pathologist of the Research Branch.

Extensive feeding trials at the old Bulawayo Quarantine Station of cattle and sheep were carried out with 24 suspected plants, of which six proved toxic.

These were: *Albizzia tanganyicensis*, *Crotalaria geminiflora*, *Ammocharis tinneana*, *Urginea sanguinea*, *Kalanchoe sp.*, *Aloe chabadii*.

There are so many plants, especially in Matabeleland, that need investigation that more staff and time are urgently required to do this type of work and a closer working liaison with our botany experts is very necessary.

Pregnancy Diagnosis

A drive by the profession (Government employees and private practitioners) to promote widespread adoption of this practice in beef herds as a stimulus to the beef industry, at subeconomic charges, produced a very luke-warm response and it is to be regretted that greater advantage was not taken of the scheme.

With the present promotion of artificial insemination in ranch beef herds now being mounted by commercial interests, it is evident that the need for such a diagnostic scheme will materially increase.

TSETSE AND TRYPANOSOMIASIS CONTROL

With the final adoption by Government of control policy based on selective elimination of free-living wild life in the tsetse infested areas, it was possible to pursue these measures actively as from October, 1964.

Controlled hunting areas were declared and the selective elimination of kudu, bushbuck, wart-hog and bush pig was intensively promoted.

The control of elephant and buffalo in these areas was undertaken by members of the Wild Life Management Branch in co-operation with our officers.

In the Sabi Lundi area it was decided that total elimination should be put into effect in the corridor between the game and cattle fences owing to its narrow width adopted in an effort to limit the number of free-living wild life shot in this section.

The numbers eliminated in controlled hunting areas to date are:

		Killed	*Total*
(*a*)	*Control Elimination*		
	Elephant	1,824	
	Buffalo	436	2,260
(*b*)	*Selective Elimination* (*food sources*)		
	Kudu	2,507	
	Bushbuck	1,240	
	Wart-hog	5,049	
	Bush Pig	1,444	10,240
(*c*)	*Total Elimination* (*south-east front only*)		
	Other species		5,423
(*d*)	*Fence Protection*		
	Various species		121

	Numbers
Summation	
(*a*) Control Elimination	2,260
(*b*) Selective Elimination	10,240
(*c*) Total Elimination	5,423
(*d*) Fence Protection	121
TOTAL	18,044

Skulls of all killed animals are stripped of flesh and collected for submission to the Department of National Parks and Wild Life Management for determination of the population dynamics of the various species. In addition a large section of a controlled hunting area has been set aside for controlled experimentation in conjunction with the other department as regards wild life population and the observed after effects of our selective elimination. We have constructed all access roads into this area but postponed shooting therein so that Wild Life will have one season's observations of the undisturbed population. Thereafter we will only eliminate the known food sources on a consecutive species plan, one following the

other, to assess end results in tsetse population and in the swing of fly to feeding on other species. Thereby we may be able to find an even more reduced selective field of elimination that would give fly control.

Carcases were all utilized economically with no wastage. Half was issued to hunters as rations, other portions were distributed as meat rations for African labour on fences and roads and wherever possible the District Commissioner utilized such meat either as rations for his local labour or it was distributed to protein-short villages or to rural health clinics for adolescent consumption.

Skins were all sun-dried and handed over to Wild Life Management for marketing.

Our Wild Life Research Section has made wide use of this elimination exercise in collecting materials from shot animals on the northern and south-eastern fronts by African teams under European supervision. Collections of materials totalling 1,317 have been made and much valuable information about the disease status in free-living wild life is gradually being accumulated as reports are returned on such material submitted to many specialist laboratories throughout the world for study.

Checks on bird life by an ornithologist in an area recently sprayed with a high concentration of dieldrin as a residual insecticide did not reveal any abnormal mortality.

Livers of birds and animals shot in this area have been collected and preserved. One hundred and seventy four of them will be assayed as to residual content of dieldrin following the third annual spraying of this insecticide.

The true perspective of the extent of our operations in relation to their end effect on the total free-living wild life can only be appreciated if cognisance is taken of Wild Life Management's "Statistical Evaluation of Game Utilization in Rhodesia in 1964" where it states that "a potential of 35,776 game animals could have been harvested without general decrease of game populations" by game cropping firms. Only 12,200 approximately were calculated to have been cropped, under the issued permits.

It cannot be overstressed that tsetse control operations are almost entirely restricted to Tribal Trust lands in which the overflowing African population must be settled and any game population therein would be speedily annihilated by primitive hunting methods. Our total elimination figure of approximately 18,000 animals can therefore be regarded as minor and of little threat to the persistence of our game populations in comparison to the eventual regaining of land urgently required for settlement of the ever-expanding African populace and their cattle. Many marginal European farms necessarily switching from tobacco to cattle will also be given a greater margin of security from tsetse infestation with the successful outcome of this exercise.

In and adjoining the shooting areas more extensive applications of persistent insecticides to tsetse habitats in areas of low tsetse density have been mounted, a total of 1,530 square miles having been sprayed. In selected areas where it could be effective, bush clearing has also been utilized to supplement shooting and spraying.

Game fences with flanking roads have been built and communication systems established in hitherto trackless difficult country as part of the selective hunting operations. Additional traffic control points have been established to restrict carriage of fly by traffic.

Works, 1964–65

Game fences constructed (10-strand steel wire, 7ft. high)	323 miles.
Game fences maintained (10-strand steel wire, 7ft. high)	274 miles.
Cattle fences constructed (5-strand barbed wire, all iron)	32 miles.
Cattle fences maintained (5-strand barbed wire, all iron)	214 miles.
Access roads constructed (spraying areas, hunting areas)	1,114 miles.
Access roads maintained (spraying areas, hunting areas)	2,176 miles.
Landing Strip Construction, Gokwe (capable of taking D.C. 3). (In conjunction with District Commissioner, Gokwe.)	

Over 317,000 cattle are now under risk of contracting Nagana and over 175,000 treatments were given this year.

The momentum of the fly advance has been slowed generally with a decrease in cases and there are grounds for a cautious optimism in regard to the outcome of the control operations even in the short time we have been applying them.

However, fly has spread on the outer flanks of the recognized areas of heavy threat and we have had to extend control operations in the Binga, Sebungwe, Copper Queen, Doma, Sipolilo and Nuanetsi areas. With a short-fall of two senior and two junior entomologists and full involvement on previously delineated fly fronts, this has meant a very heavy load on staff, and our financial resources have been severely strained to meet the expanding challenges. The extension of operations has also markedly over-burdened the numerically inadequate administrative staff.

Tsetse Research

The F.A.O. Research Immunologist post was vacated in June, 1965, this officer leaving to get married, and her very promising research activities had to be terminated for lack of a suitable replacement. With the departure of her European senior technician on extended military training, the resignation of the African senior technician to take up an American scholarship and the assumption of the duties of the Chief Veterinary Officer (Trypanosomiasis) by the Senior Veterinary Research Officer (Trypanosomiasis), as no leave replacement was available, it was impossible to continue this promising avenue of research and it has been temporarily "mothballed".

The Agricultural Research Council research project into the chemo-sterilization of the male tsetse fly has got under way successfully and the possible limitations of this control technique are being slowly established. It seems unlikely that control analogous to that of the screw worm fly in U.S.A. can be foreseen in regard to tsetse fly unless some new technique of laboratory rearing of tsetse flies can be found. The creation of a large open-air breeding station of tsetse flies near Chirundu Bridge in the Zambesi Valley to secure optimal production of pupae is now under course.

Research into the habits and biology of tsetse flies continues and studies have begun on the relationship between tsetse populations and free-living wild life in co-operation with the Research Officer of the Wild Life Management Branch.

An extended study of commercial insecticides is in progress at Lusulu to discover one which will give residual toxicity on the coats of treated cattle to ensure a significant kill of tsetse fly. To date, concentrations high enough to give residual toxicity to tsetse are usually cumulatively toxic to cattle by the third or fourth treatment and there seems little hope of a successful outcome to this project unless a new range of less toxic material is developed.

The general position is summarized in the following monthly incidence table which reveals the fall in cases since April, 1965, which is suggestive of better control being gradually regained.

MONTHLY INCIDENCE OF TRYPANOSOMIASIS CASES 1958–65

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
Average 1958–63 . .	79·6	85·8	82·8	112·2	105·8	251	178·6	200	155·6	115	106·8	109
Totals 1963–64 . .	248	293	265	438	463	670	840	577	554	459	347	301
Totals 1964–65 . .	291	422	464	754	800	743	568	399	323	239	202	189

The most serious deterioration is in the Sanyati area where spreads into the Chenjiri A.P.A. and Sanyati T.T.L. are as yet not arrested and spreads further east into the Umfuli A.P.A. and Magondi T.T.L. are high possibilities. These areas had previously been reclaimed from tsetse before 1950 and had remained free until 1964–65.

Spreads into the Tribal Trust lands lying west of the Inyanga North area, where civil disobedience had led to the breakdown of control, revealed a serious westward advance of fly and further extensive methods of control will have to be applied here in the immediate future.

International Fly Control Project, South East Fly Front

The combined spraying operation of the south-east front by the Republic, Moçambique and Rhodesia reached a new peak in its third year of application.

As a preliminary measure 260 miles of roads were opened up by bulldozers in the Gona-re-Zhou area and the whole operation (800 square miles) was mapped out on aerial photographs and working maps.

Five teams were engaged on these operations, three under South African supervision covered the South Lundi area and two under our supervision covered the North Lundi area from Chipinda Pools to the Sabi and from the Chuhanja Hills to the Hippo Valley Estates.

A total of 38,475 gallons of 3·1 per cent. dieldrin emulsion was applied by pneumatic knapsack sprayers to the vegetation lining 808 miles of drainages, to 182 miles of roads and 135 miles of vegetation contacts. Total cost of the applied insecticide was £12,820.

It was evident by the end of September, 1965, that the combination of this exercise with the game elimination project had created a great retreat in the actual ambit of the fly and that there was a good chance of this control programme achieving its end object.

FIELD EXPERIMENTATION

Veterinary Research Officer (Trypanosomiasis)

Despite lack of staff, much work has been accomplished at the Lusulu Research Station.

Cattle

Response of stock to drug treatment under high trypanosomiasis challenge in the field is being continually studied, especially in reference to breeding capabilities.

Drug Resistance

The administration of iso-metamidium to all stock for one year has completely eliminated antrycide-resistant strains of *T. congolense* fully established in cattle and evidently being transmitted by the local tsetse fly population.

The dosage of iso-metamidium for prophylaxis for a two or three month period was established, and studies of breed tolerance were made.

Dairy Cattle

Friesland cows have been introduced to study the economics of milk production in high tsetse challenge areas when such cattle are held under the continuous protection of drugs.

Sheep Studies (Persian and Indigenous)

Under a system of bi-monthly administration of Berenil in an area of high challenge sheep showed infection at an average interval of 40–46 days.

The control group was maintained free of infection with iso-metamidium on a bi-monthly basis. In the same area it has been demonstrated that sheep can show bouts of high rates of infection of the blood stream at irregular intervals over a prolonged period with spontaneous recovery. Out of 109 smears taken from one animal on a twice weekly basis, 33 smears proved positive, 30 showing *T. congolense*, two *T. congolense* and *vivax*, one *T. vivax* only. This animal was only treated once with Berenil and lived.

Goat Studies

This study is yet incomplete but there are indications that susceptibles may succumb rapidly in an area of high challenge but others can exist with irregular periods of patent blood stream infection that do not always end in a fulminating infection and death.

Both these experiments stress the danger of allowing occupation of areas of fly challenge by Africans with sheep and goats, hitherto regarded as of little import in the light of trypanosomiasis control. Flies with a high rate of infection are created, accustomed to survival on domestic stock food sources, and the safety of eventual introduction of cattle is severely prejudiced.

Pig Studies

In breeding pigs introduced into an area of high challenge it was found that they soon became infected with a drug-resistant strain of *T. simiae* but they could be kept alive and bred provided they were protected from any other virulent wild strain of trypanosomes by a bi-monthly regime of antrycide chloride prophylaxis. Untreated pigs in the litters were soon chronically infected with *T. simiae*, severely stunted and died from a chronic infection at the 106–164th day.

The pregnant and suckling females showed great loss of condition and stress symptoms, especially during the suckling period.

It is very evident that pig breeding under these conditions would be completely uneconomic.

Donkey Studies

A tentative conclusion was reached that donkeys could be kept alive in high challenge areas with iso-metamidium injections, 0·5 mg./kg. in 0·5 per cent. solution, at three-monthly intervals. This work continues.

Field Immunity

Work continues on the observation of an extended period of aparasitaemia developing in cattle after prolonged treatment with prophylactic drugs. To demonstrate whether this is due to a created immunity or to an accumulation of the drug in the tissues or body fluids, lengthy experimentation has been devised and is now in progress.

Drug Trials

Research into new compounds has been minimal owing to lack of staff.

Trypanosomiasis in Free Living Wildlife

One hundred and fifty-five blood smears were examined from animals shot during tsetse control operations.

Nine cases of trypanosomiasis were demonstrated as follows:

Host	*Trypanosome*	*District*
Buffalo	*T. congolense*	Urungwe
Wart-hog	*T. congolense* and/or *simiae*	Urungwe
Wart-hog	*T. congolense*	Urungwe
Kudu	*T. vivax* and *theileri*	Sebungwe
Buffalo	*T. vivax*	Sebungwe
Buffalo	*T. congolense*	Sebungwe
Bushbuck	*T. vivax* and *congolense*	Sabi–Lundi
Kudu	*T. congolense*	Lusulu
Kudu	*T. congolense*	Lusulu

Storage of Trypanosomes

The following strains of trypanosomes are now held in deep freeze in the laboratory pending further investigations when staff is available.

Species	*Number of strains held*
T. congolense	33
T. vivax	12
T. rhodesiense	8
T. brucei	1
T. simiae	1

Field Experimentation (Entomologists and Ecologist)

Detailed observations of tsetse fly behaviour in the field have been pursued and a much more reliable method of sampling is emerging in practice which reflects more accurately changes in the total population.

The demonstration of the persistence of female flies in Brachystegia woodland in the dry season, instead of the previously accepted theory of their retreat to riverine vegetation explains the past failure of bush-clearing or application of insecticide to riverine vegetation in winter as a permanent control of fly.

Game/Tsetse Relationships

One officer is now specializing in this field of study in co-operation with the Wild Life Management Branch; this official is a game biologist.

Tsetse Fly Feed Investigations

A scholarship has been created at the Lister Institute, Elstree, for the study of the blood meals of tsetse fly, mainly financed by this department for two years.

This scholar, already appointed, is carrying out extensive studies of the regular flow of tsetse blood meals from all control areas of the country. If any sudden change of pattern of feeding occurs then we will have immediate information of the same.

Tsetse and trypanosomiasis control has been the major task of the department this year and tremendous efforts have been made to regain the control that was lost with the abandonment of the control of free-living wild life by shooting. Our unwelcome task has unfortunately not been made any easier by ill-informed criticism and emotionalism in respect of a selective minor wild life elimination fully proven by factual observation to be effectual on a lasting basis.

Minor Disease Factors

Overall the minor diseases still had a wide erosive effect largely in the smaller European stock holdings and the communal Tribal Trust lands.

Certain conditions, with arthropod cyclic involvement, such as sweating sickness, myiasis (screw worm), heartwater, anaplasmosis and piroplasmosis, are waning in incidence with the wider use of organic acaricides but their sporadic incidence in the smaller herds when dipping is neglected in peak cropping periods still results in financial losses to the livestock industry that should not be tolerated when so much has been done by Government to control and eradicate the major decimative diseases. The same can be said about diseases like quarter evil, contagious abortion, paratyphoid, enterotoxaemia, etc., for which cheap and effective prophylactic vaccines are easily available but vaccination is ignored until unnecessary mortality has occurred.

There has been, however, in the past year a more intense awareness of the profitability of prophylactic vaccination, of strategic dipping to wipe out the seasonal rises of ticks at their inception and of adoption of dosing of stock to the rise and fall of internal parasites in relation to rainfall, etc.

This awareness is giving a marked increase in the demands for veterinary prophylactic advice and measures that are welcome signs of an increase in efficiency in stock handling that is long overdue.

The potential of beef export is such that all-out efforts must be made to conserve every individual animal to reach its greatest economical exploitation.

MEAT INSPECTION

Intensive supervision was maintained at four Cold Storage Commission abattoirs at Salisbury, Bulawayo, Fort Victoria and Umtali. The Colcom Factory, Salisbury, solely devoted to pigs, was similarly supervised. Messrs. Liebig's Factory, West Nicholson, performed no slaughtering but canned beef derived from C.S.C. Bulawayo.

Slaughterings	1965	1964
Cattle and calves	281,626	274,821
Sheep	40,441	36,547
Goats	6,184	2,621
Pigs	103,020	106,018

The general quality of beef produced continued to show improvement in quality and type and is considerably better than that of a decade ago when it was still common for large numbers of carcases to be condemned for emaciation at the end of the dry season. This has become a thing of the past.

Total Condemnations	*Total*	*%*
Cattle and calves	2,276	0·8%
Sheep	59	0·15%
Goats	8	0·13%
Pigs	1,199	1·16%

Causes (beef carcases)	*Total*	*% of condemnations*
Oedema and emaciation	885	38·9
Measles	581	25·7
Sarcocysts	161	7
Pleurisy and Peritonitis	98	3·9
Trauma	60	2·6
Other causes (varied)	491	21·9
	2,276	

Beef Measles

It was found that 3,096 carcases were infected, an incidence of 1·0 per cent. Generalized infection occurred in 581, localized infection in 2,515 carcases, an approximate ratio of 1 to 4 being totally condemned.

Locality Incidence	1965	1964
Salisbury	0·8%	0·9%
Bulawayo	2·1%	2·0%
Fort Victoria	1·4%	1·4%
Umtali	0·9%	0·8%

Pork Measles

Eight hundred and forty three carcases were found infected, an incidence of 0·84 per cent.

Locality Incidence	1965	1964
Salisbury (Colcom)	0·06%	0·16%
Bulawayo	3·2%	2·4%
Fort Victoria	1·0%	1·3%
Umtali	—	0·05%

The incidence at Bulawayo is directly related to the high proportion of African-produced pigs slaughtered. Most cases show generalization. Considering that man may excrete eight to ten ripe segments daily of *Taenia solium* each containing 30,000 eggs, the pig, therefore, in its historical role of African village scavenger, may ingest at one meal no less than 300,000 tapeworm eggs, then generalization is only to be expected.

Sarcocysts

This condition is commonly observed and is almost certainly a parasitic infestation but there is considerable doubt as to whether sarcocysts are the actual cause and the Senior Meat Hygiene Officer has suggested that the condition would be better termed eosinophilic myositis.

Hydatidosis

No hydatid cysts were found in sheep, goats and pigs, this condition being confined to the bovine.

Incidence	*Lungs*	*Liver*	*Total*
Total . . .	2,505	77	2,582

The proportional relation of lung infection to that of liver is approximately 30 to 1.

These cysts continue to be mainly derived from free-living carnivores (jackal, hyaenas, etc.) with a 90 per cent. infectivity ratio; fortunately they are non-infective to humans.

Trichinosis

A survey of 2,064 samples of the diaphragm of boars and sows slaughtered at Colcom, Salisbury, using the German technique of 14 pieces per sample, was carried out from October, 1964, to July, 1965, with completely negative findings.

Hygiene

Marked progress has been made in the modernization of the C.S.C. abattoirs with the introduction of low-level bleeding, abolition of all wooden fittings and replacement by metal equipment, easy availability of wash basins at the site of operations, early erection of ablution blocks, etc.

The introduction of routine bacteriological tests in the slaughter hall, boning and processing room in the abattoirs using the "media sausage" technique has proved extremely useful in detecting undesirable surface contamination, etc., with resultant early elimination of the causal factors.

Medical examination of all staff at abattoirs, European and African, and Government officials working therein, is now a compulsory routine measure. The examination of rectal swabs for pathogenic enteric organisms, blood samples for possible typhoid carriers, is being regularly effected. All water used in any export abattoir has now been and will continue to be checked to conform with the international code of "potable water".

Daily inspection of all staff is now obligatory and we have now reached the position where we can meet the extremely stringent major conditions imposed by our importers. A few minor items remain that will require to be dealt with in the near future.

RESEARCH BRANCH

The conversion of staff from a basis of junior and senior postings, mostly based on seniority, to the main body of officers being classified as specialists with salary adjustment and advancement geared to their individual worth as scientists has created a new enthusiasm within this branch and definitely promoted recruitment.

The creation of six additional technical posts was an important addition leading to considerable expansion in research projects.

More adaptation and conversion of buildings to accommodate staff had therefore to be undertaken.

This, however, had to be severely curtailed in view of the threat of our evacuation from the present site, which has hung over this branch since 1957 and completely thwarted all sorely needed expansion of services.

The decision to construct new laboratories at Hatcliffe Estate has again been postponed and this creates a complete restrictively effect on efforts to give the livestock economy the research facilities it must have to reach its desired peak of efficiency.

Meanwhile much valuable time was wasted by research officers on routine diagnostic services which could be done more efficiently by local veterinary investigation officers if the necessary expansion in field staff could be authorized.

Diagnostic Services

A total of 25,461 specimens for diagnosis were received and dealt with during the year and these were classified as follows:

Blood smears	126
Specimens, including poultry	16,095
General bacteriological	433
Rabies	216
Foetal	57
Blood	4,989
Milk	662
Tuberculosis	38
Rift Valley Fever	4
Quarter Evil	11
Poisons	178
Enterotoxaemia	22
Dourine (export)	80
carried forward	22,911

Rabbit post-mortems	38
Chinchilla post-mortems	39
Pig post-mortems	23
Sheep post-mortems	18
Dog post-mortems	2
Bovine post-mortems	5
Haematological	18
Miscellaneous	206
Plants	20
Tampons	1,239
Histological	163
Cold Storage Commission specimens	715
Biochemical	15
brought forward	22,911
TOTAL	25,412

From the above material the following diagnostic details are available:

SCHEDULED DISEASES	
Rabies: Specimens	216
Histologicals	196
Histologicals positive	50
Biologicals completed	150
Biologicals positive	13
Tuberculosis: Specimens	38
Specimens positive	8
Brucellosis: Blood agglutination tests	4,989
Positive	627
Indefinite	195
Tampons examined	1,239
Tampons positive	95

NON-SCHEDULED DISEASES	
Vibrio foetus: Tampons examined	1,239
Tampons positive	92
Tampons suspicious	11
Mastitis: Milk samples examined	659
Milk samples positive	294
Poisons: Arsenic specimens	146
Arsenic positive	35
Nitrate specimens	5
Nitrate positive	1
Lead specimens	39
Lead positive	7

RABIES

Positive cases: Total 63

Species	*Total*	*Histo+*	*Biol+*
Dogs	46	37	9
Jackals	6	6	—
Cats	3	—	3
Baboon	1	1	—
Bovine	2	1	1
Human	5	5	

RABIES VACCINE

At least 32 samples of rabies vaccine were tested for viability during the year. The increased number was due to the fact that the laboratory investigated a field report of lack of vacuum in several samples. It is customary for us to examine for viability only one sample of each denomination in every batch of vaccine coming into the country.

Following the discovery of lack of vacuum we tested all stocks on hand with a high frequency spark tester. All samples showing partial or no vacuum were replaced free of charge by the company concerned and on investigation the fault was traced to an inferior type of bottle.

One batch of vaccine was refused because of low viability test. While it is agreed that viability is not necessarily a test of potency, the factory requirements for this particular type of vaccine required a viability of $10^{-3 \cdot 5}$. As our accepted standard was $10^{-2 \cdot 5}$ and this particular sample fell below that level, this was considered a justifiable reason for refusing to accept the particular batch of vaccine, since it was considered that such a drop in viability must indicate the existence of stress of the vaccine between the time it had been tested at the factory and the time it was tested by us.

PLANT POISONING

The following plants were investigated during the year:

Albizia tanganyicensis—pods were not toxic to cattle.

Albizia versicolor—the green seeds and pods shown to be poisonous to guinea pigs and to cattle. (Reports from the Sinoia–Banket area suggest that pods from this tree have been responsible for the loss of over 300 cattle. It is difficult to account for the losses experienced from this source this year since the trees have been in the area for the last 50 years; it is suggested that two drought years have stimulated the trees to extra production of pods which were blown down in the comparatively green state due to high winds—work on this problem is proceeding.)

Cassia singueana—not toxic to sheep or guinea pigs.
Clerodendrum—not toxic to sheep or guinea pigs.
Colocasia antiquorum—rhizome toxic to guinea pigs but not to sheep.
Crotalaria ochroleuca—investigation still in progress.
Fadogia tetraquetra—investigation still in progress.
Cryptosepalum maraviense—not toxic to sheep or guinea pigs.
Jatropha species—not toxic to sheep or guinea pigs.
Fragia kirkiana—not toxic to sheep or guinea pigs.
Solanum nigrum—not toxic to guinea pigs.

Aflatoxicosis

No outbreaks of this condition were recorded this year although Chemistry Department survey has indicated its presence in our groundnuts.

It would appear that the methods of improved production instigated early after the discovery of this condition have proved a very effective limiting factor and the agreement undertaken by our various feed firms to limit the use of affected ground nuts to certain concentrations and certain classes of stock has also proved effective.

Enterotoxaemia

Although several cases have been diagnosed this year—eight in all—it is evident that our vaccination campaign is having effect, so that most of our serious sheep farmers vaccinate their flocks.

Mastitis

While sporadic cases are periodically occurring the improved hygiene being advocated by our veterinarians, both field staff and private practitioners, appears to be becoming more evident as breakdowns in herds were rarer this year.

Cold Storage Commission Specimens

The provision of a small laboratory manned by a technician with experience in meat hygiene in the Cold Storage Commission, Salisbury, has resulted in a very considerable increase in specimens received.

A gall bladder survey for bovine salmonellae resulted in the examination of 531 such samples—all negative.

Some 2,064 pig diaphragms were examined for trichina, and about 200 bacteriological samples were undertaken for surface contamination of meat.

Foetal Specimens

The following breakdown of the foetal specimens is available:

Negative examinations	45
Negative—decomposed no bacteriology	5
Negative mummified	1
Brucella abortus	2
Corynebacterium pyogenes	1
Streptococcal infection	1
Cotyledons only. negative	2

Histology

The histology laboratory has functioned efficiently through the year. There has been a gradual increase in the number of specimens being processed, and the acquisition of an automatic microtome knife sharpener was very welcome. Filing cabinets for blocks and sections are also being found useful.

The photomicrography equipment is being used increasingly by members of the laboratory staff.

During the year histological examination was completed of 219 specimens. This does not reflect the total output of the histology laboratory, as sections are produced for various members of the staff, and a number of specimens form part of investigation projects which have not been completed.

Specimens processed	368
Blocks prepared plus rabies blocks	1,314

Chinchillas

The pattern of enteritic conditions reported from other countries is also present here. The cause of death was predominantly enteritis involving impaction, intussusception: the organisms involved being Giardia lamblia, trichomonas, Proteus species and Pseudomonas pyocyanea.

A total of 6,995 specimens examined during the year, can be broken down as follows:

Chickens	5,626=80·4%
Turkeys	114= 1·6%
Game birds	70= 1·0%
Waterfowls	44= 0·6%
Pigeons	19= 0·3%
Psittacines	55= 0·8%
Other cage birds	1,067=15·3%

Chickens: 5,626 specimens	*Number of Specimens*	*Percentage*
Leucosis	1,764	31·4
Fowl paralysis	13	0·2
Neoplasms	168	3·0
Infectious bronchitis	2	0·04
Fowl pox	6	0·1
Avian monocytosis	15	0·3
Infectious coryza	8	0·1
Mycoplasmosis	47	0·8
Fowl typhoid	41	0·7
Salmonellosis (S. newport)	1	0·02
Salmonellosis (S. typhi-murium)	4	0·1
E. coli speticaemia, omphalitis	58	1·0
Staphylococcosis	10	0·2
Streptococcosis	37	0·7
Avian tuberculosis	2	0·04
Caecal coccidiosis	19	0·3
Intestinal coccidiosis	284	5·0
Histomoniasis	160	4·6
Trichomoniasis	3	0·05
Aegyptianellosis	13	0·2
Leucocytozoon infection	1	0·02
Spirochaetosis	1	0·02
Helminthiasis	17	0·3
Ectoparasitosis	1	0·02
Peritonitis, egg peritonitis prolapse	323	5·7
Non specific enteritis	46	0·8
Nephrosis, nephritis, visceral gout	148	2·6
Pneumonia, chilling	236	4·2
Anaemia	8	0·1
Rickets	6	0·1
Cage layer fatigue	1	0·02
Perosis	3	0·05
Encephalomalacia	3	0·05
Fatty liver syndrome	72	1·3
Poisoning	6	0·1
Miscellaneous conditions	424	7·5
Negative reports	1,575	28·0
Turkeys: 114 specimens		
Pox	1	0·9
Fowl typhoid	2	1·8
Salmonellosis (S. paratyphi A)	6	5·3
Coccidiosis	1	9·6
Aegyptianellosis	1	0·9
Helminthiasis	1	0·9
Non specific enteritis	3	2·6
Pneumonia, chilling	64	56·1
Nephrosis, nephritis	4	3·5
Anaemia	3	2·6
Gizzard erosion	3	2·6
Malicious injury	1	0·9
Miscellaneous conditions	7	6·1
Negative reports	7	6·1
Game birds: 70 specimens		
Leucosis	2	2·9
Fowl typhoid	4	5·7
Clostridiosis	27	38·6
Coccidiosis	1	1·4
Histomoniasis	19	27·1
Plasmodium fallax infection	1	1·4
Helminthiasis	1	1·4
Non specific enteritis	2	2·9

	Number of specimens	Percentage
Visceral gout	2	2·9
Anaemia	1	1·4
Negative reports	4	5·7
Waterfowls: 44 specimens		
Neoplasms	1	2·3
Salmonellosis (S. typhi-murium)	4	9·1
E. coli septicaemia	10	22·7
Streptococcosis	1	2·3
Aspergillosis	1	2·3
Aegyptianellosis	1	2·3
Helminthiasis (Echinostomes)	1	2·3
Peritonitis	1	2·3
Hepatitis	1	2·3
Nephritis	1	2·3
Miscellaneous conditions	3	6·8
Negative reports	19	43·2
Pigeons: 19 specimens		
Neoplasms	1	5·3
Pigeon Pox	1	5·3
Salmonellosis (S. typhi murium)	1	5·3
Coccidiosis	1	5·3
Haemoproteus columbae infection	2	10·5
Plasmodium sp. infection	1	5·3
Helminthiasis	6	31·6
Non specific enteritis	1	5·3
Miscellaneous conditions	2	10·5
Negative reports	3	15·6
Psittacines: 55 specimens		
E. coli septicaemia	1	1·8
Staphylococcosis	4	7·3
Aegyptianellosis	9	16·4
Coccidiosis	4	7·3
Helminthiasis	5	9·1
Acariasis	1	1·8
Non specific enteritis	5	9·1
Pneumonia	1	1·8
Visceral gout	2	3·6
Miscellaneous conditions	10	18·2
Negative reports	12	21·8
Other cagebirds: 1,067 specimens		
Salmonellosis (S. typhi murium)	22	2·0
E. coli septicaemia	61	5·7
Coccidiosis	2	0·2
Aegyptianellosis	1	0·1
Trypanosoma sp. infection	2	0·2
Haemoproteus fringillae infection	8	0·8
Lankesterella sp. infection	1	0·1
Microfilaria sp. infection	2	0·2
Respiratory acariasis	1	0·1
Non specific enteritis	4	0·4
Hepatitis	7	0·7
Nephrosis	1	0·1
Pneumonia	1	0·1
Miscellaneous conditions	3	0·3
Negative reports	951	89·1

The very high percentage of negative reports for chickens is explained by the fact that 83·4 per cent. of all chickens submitted came from a very large poultry farm close to Salisbury where an outbreak of Fowl typhoid occurred between 1st April and 30th September; these included not only natural mortality but also birds culled for various reasons since we were attempting to control the condition by short interval testing and all removals had to be submitted to the laboratory.

PARASITOLOGICAL INVESTIGATION OF CHICKENS

Total of intestines examined	211
Negative reports	80

	Light	*Medium*	*High infestation*
Ascaridia	47 (22·3%)	26 (12·3%)	13 (6·2%)
Heterakis	37 (17·5%)	9 (4·3%)	4 (1·9%)
Capillaria	4 (1·9%)	1 (0·5%)	6 (2·9%)
Cestodes	27 (12·8%)	14 (6·6%)	14 (6·6%)

Capillaria, by far the most pathogenic of the intestinal worms of the chicken, do, fortunately, not occur very frequently. Only one of the six cases of heavy infestation was in a commercial flock. C. obsignata was found in most cases but C. bursata has also been identified.

A survey of cestodes of poultry was carried out. The final results are not yet known as we are still waiting for the confirmation of our identifications by Onderstepoort.

Poultry Disease Survey

Sampling has been carried out in the Gokwe North Area. The H.I. test for Newcastle disease was negative on all sera. Out of 58 blood smears examined 34 (58·6 per cent.) showed varying degrees of infection with *Leucocytozoon andrewsi* covering all localities where smears had been taken. In addition to that *Trypanosoma gallinarum* was found in three slides from two localities and a heavy infection with *Aegyptianella pullorum* in one preparation.

The high incidence of *L. andrewsi* and the relatively large area it occurs in (the parasite has also been found near Karoi) make it hard to believe that its presence in Africa should not have been described before.

Newcastle Disease Vaccination

Discussions with the poultry industry and the Rhodesia National Farmers' Union have resulted in the agreement to allow the use of a dead Newcastle disease vaccine by those poultry farmers who may so wish. Although no Newcastle disease exists at present in the country the risk of its introduction to an absolutely unprotected industry is well recognized and appreciated.

QUARANTINE OF IMPORTED ANIMALS

While, in general, the use of the laboratory premises as an Importation Quarantine Station has ceased, we have accepted the responsibility for quarantining certain animals which arrived by air. These were four large white gilts, three large white boars and one welsh boar, all originating from the United Kingdom.

PREVENTATIVE AND CURATIVE SERVICES

Vaccines	1965	1964	1963
Anthrax	143,500	28,850	33,500
Blue tongue	25,600	13,350	14,900
Calf paratyphoid	8,378	8,289	9,160
Calf paratyphoid for use in adults	nil	238	506
Contagious abortion	112,316	94,984	117,941
Brucella Rev. 1	360	400	660
Enterotoxaemia	52,180	47,770	35,700
Fowl pox	385,000	396,500	404,900
Gallsickness	14,843	13,340	17,655
Redwater/Gallsickness	11,420	10,270	7,922
Horsesickness	5,313	6,001	5,713
Lumpy skin	6,890	1,174	1,829
Quarter Evil	408,330	379,860	458,450
Quarter Evil/Malignant Oedema	39,900	44,960	67,560
Rift Valley Fever	nil	100	150
Lamsiekte	2,650	1,320	1,480
Lamb dysentery	nil	900	nil
Fowl typhoid	33,900	nil	nil

The very considerable increase in the use of Anthrax vaccine was due to outbreaks in Matabeleland. The vaccination campaigns undertaken will be repeated in these outbreak areas for three years in all.

The expansion in the use of Bluetongue vaccine from 13,000 to 25,000 was due to the appearance of a relatively virulent type in areas where owners had not resorted to vaccination. Although advice given to farmers is that only the Blackhead Persian sheep are resistant whereas all exotic or exotic crosses must be vaccinated, many farmers do not vaccinate until the disease appears in their area.

Artificial Insemination Service

There has been a considerable reduction in the doses of semen used by inseminators this year. This is basically due to the fact that Salisbury centre ceased operation on 31st January, 1965.

An additive factor is that during the year Cattle Breeder Services, the private A.I. organization, have continued to expand and their policy of training farmer inseminators has resulted in the majority of genuine dairy farmers undertaking A.I. themselves. This fact had so reduced the operation of Government A.I. in the Salisbury area that the subsidization factor was becoming greater and greater. In point of fact in a charge per insemination of 27s. 6d., the cost of mileage per insemination was 26s.

A further private A.I. firm, "Bull in a Thousand", is also now established in Salisbury and there would seem no doubt that these two firms should be quite capable of undertaking all A.I. required whether in the dairy or the beef industry. Both of these firms are interested in stimulating interest in beef A.I. and while this has possibilities the present extensive method of running beef, especially ranch cows, makes A.I. a relatively expensive proposition.

RESEARCH AND INVESTIGATION

Theileriosis

With effect from 31st October, 1964, a research unit under Dr. Matson was established to study protozoological problems and spent this year studying the condition as it exists in Rhodesia.

The problem of Theileriosis in Rhodesia and the proposed programme of research were detailed in a publication entitled "Control of Anaplasmosis, Babesiosis and Theileriosis in Rhodesia" and presented at the O.I.E. meeting in Paris in May, 1965.

In brief the situation is that with the gradual eradication of *Theileria parva* (East Coast Fever) from Rhodesia, the last confirmed case in 1954, a milder form of Theileriosis (buffalo disease, January disease), believed to be due to *Theileria lawrencei*, has appeared among cattle and has increased to as many as 20–40 outbreaks per annum. Mortality is occasionally as high as in East Coast Fever but frequently only one or two animals die before control measures apparently prevent further deaths. At first the new form of Theileriosis was associated with buffalo, but latterly the disease has more frequently occurred amongst cattle in the complete absence of buffalo.

Table 1 summarises the number of Theileriosis outbreaks and the mortality experienced per ten year period since 1903 when the initial epizootic of East Coast Fever eliminated approximately one-third of the country's cattle population.

Table 1.—Theileriosis Outbreaks and Mortality

Period	*Outbreaks*			*Mortality*		
	T. parva	*T. lawrencei*	*Total*	*T. parva*	*T. lawrencei*	*Total*
*1903–1905	?	?	?	19,270	0	19,270
1906–1915	101	0	101	5,010	0	5,010
1916–1925	115	0	115	6,116	0	6,116
†1926–1935	89	0	89	5,813	0	5,813
1936–1945	62	34	96	1,213	86	1,299
‡1946–1955	2	170	172	47	2,451	2,498
1956–1965	0	314	314	0	2,770	2,770

* 1903–1905=period of initial epizootic of East Coast Fever.
† 1934–1935=buffalo disease discovered—detailed records not available.
‡ 1946–1947=records incomplete.

The cattle population of Rhodesia was estimated as shown in Table 2.

Table 2.—Cattle Population in Rhodesia

Year	*Estimated number*
1905	66,000
1915	890,000
1925	2,100,000
1935	2,500,000
1945	2,900,000
1955	3,100,000
1965	3,800,000

From a consideration of Tables 1 and 2 it is evident that Theileriosis is playing a decreasing role in causing mortality in relation to the increasing cattle population. This is in spite of the increasing number of outbreaks of *T. lawrencei* in recent decades. While the latter fact gives rise to disquiet the overall

situation appeared reasonable until, in 1964, workers in East Africa showed that *T. lawrencei* could, under experimental conditions by passage through cattle, suddenly revert into the more dangerous *T. parva*. Conditions appeared suitable in Rhodesia for just such a change thus once again exposing the cattle industry to the threat of this decimative disease. An immediate inquiry was therefore initiated into Theileriosis in Rhodesia.

A study of the earlier records of Theileriosis in Rhodesia confirmed beyond doubt that *Theileria parva* distinguished by its large number of schizonts and many piros, was the causal agent of Theileriosis in the early days. Similarly, the records confirmed that in the 1930s a new Theileria parasite, distinguished by its relatively few schizonts and far fewer piros, appeared associated with the Theileriosis outbreaks. This new form of Theileriosis gradually predominated. There are several earlier records of isolated cases of Theileriosis characterized by the presence of schizonts but with few, if any, piros present, namely in 1911, 1912, 1914 and 1928.

During the 1964–65 season 25 outbreaks of Theileriosis were diagnozed and controlled by the field staff. Table 3 summarizes the data pertaining to these outbreaks.

TABLE 3.—THEILERIOSIS OUTBREAKS AND MORTALITY IN 1964–65

District	*Farm*	*Number of cattle*	*Number of deaths*
Salisbury	Kudara	700	13
	Uithoek	311	1
	Dunedin C	4	4
	Progress	40	1
Bulawayo	Luchabi	1,816	17
	Grays Block	1,086	13
	Vlakfontein	2,000	1
Fort Victoria	Kippure	1,050	13
Umtali	Uitkyk	228	26
	Demara	200	1
	Glenspey	28	3
	Claremont	85	1
	Burnaby	20	?
Sinoia	Marshlands	270	2
	Crescent Park	16	5
	Natalia	230	32
	Pindi Park	198	8
	Hillandale	7	1
	Manengas	630	1
	Argyle Park	407	1
	Portelet	3,395	9
	Maunga	65	1
	Lions Den	20	?
	Poko Ranch	510	3
		TOTAL:	157

A detailed study was made of the diagnostic specimens emanating from 57 cases of Theileriosis on 23 of the farms listed in Table 3 and two other farms (Riverside and A.R.C. Chirundu Experimental Station) where recovered cases were detected. Table 4 summarizes this data. In each case the highest count of parasites recorded has been given for each animal examined.

TABLE 4.—THEILERIOSIS DIAGNOSTIC SPECIMENS IN 1964–65

Farm	*Case*	*Specimen*			*Schizonts per 1,000 lymphocytes*	*Piros per 1,000 erythrocytes*
		Blood	*Gland*	*Spleen*		
Crescent Park	1	+	+	—	40	0
Crescent Park	2	+	+	—	85	17
Crescent Park	3	+	+	—	0	14
Crescent Park	4	+	+	—	44	80
Crescent Park	5	+	+	—	100	2
Marshlands	6	+	+	—	0	<1
Marshlands	7	+	+	—	6	<1
Hillandale	8	—	+	—	39	—
Pindi Parl	9	+	+	—	4	0
Pindi Parl	10	+	+	—	32	<1
Pindi Parl	11	+	+	—	0	<1
Pindi Parl	12	+	+	—	1	0
Pindi Parl	13	+	+	—	12	6

Farm	Case	Specimen			Schizonts per 1,000 lymphocytes	Piros per 1,000 erythrocytes
		Blood	Gland	Spleen		
Pindi Parl	14	+	+	—	20	3
Natalia	15	—	+	—	4	—
Natalia	16	—	+	—	20	—
Natalia	17	+	+	+	48	6
Portelet	18	—	+	—	<1	—
Portelet	19	—	+	—	<1	—
Portelet	20	+	+	+	26	0
Portelet	21	+	+	+	<1	0
Portelet	22	+	+	+	3	0
Portelet	23	+	+	+	3	<1
Portelet	24	+	+	+	5	0
Portelet	25	+	+	+	<1	0
Portelet	26	+	+	+	87	0
Portelet	27	+	+	+	4	0
Portelet	28	+	+	+	42	0
Portelet	29	+	+	+	120	0
Portelet	30	+	+	+	62	0
Argyle Park	31	+	+	—	<1	0
Argyle Park	32	+	+	—	<1	0
Argyle Park	33	+	+	—	47	4
Argyle Park	34	—	—	+	13	—
Manengas	35	—	+	+	390	—
Manengas	36	—	+	+	45	—
Lions Den	37	+	+	+	<1	0
Poko Ranch	38	+	—	+	5	0
Maunga	39	+	+	—	<1	0
Naba	40	+	—	—	0	<1
Mangula Mine	41	—	+	+	123	—
A.R.C. Chirundu	42	+	—	—	0	<1
Uitkyk	43	+	+	—	195	55
Uithoek	44	+	—	+	3	0
Dunedin C	45	—	+	+	70	0
Claremont	46	+	+	+	24	<1
Glenspey	47	+	+	+	3	0
Burnaby	48	—	+	+	5	—
Progress	49	—	—	+	78	—
Riverside	50	+	—	—	0	<1
Riverside	51	+	—	—	0	<1
Riverside	52	+	—	—	0	<1
Riverside	53	+	—	—	0	<1
Luchabi	54	—	+	—	<1	—
Luchabi	55	+	—	+	<1	0
Grays Block	56	—	+	—	<1	—
Vlakfontein	57	+	+	+	65	2

From the diagnostic data in Table 4 it is concluded that there is no evidence of *Theileria parva* (East Coast Fever). In the terminal stages of East Coast Fever schizonts are usually so numerous as to exceed 600 per 1,000 lymphocytes. Similarly at this stage of the disease the number of piros usually exceeds the number of erythrocytes.

Table 4 does not permit a clear differentiation between *Theileria lawrencei* and *Theileria mutans* and these species may both be present. A clear differentiation cannot be made on the smear examination alone. In respect of *Theileria lawrencei* it would be unusual for a bovine which has not been splenectomized to show piros but this position could be confused by piros present through a concurrent infection with *T. mutans*. With field specimens it is also sometimes very difficult to detect piros owing to contamination by dust and other extraneous matter.

In collaboration with Professor W. O. Neitz, of Onderstepoort, attempts were made to isolate Theileria strains from the various field outbreaks. Isolation attempts were made from 10 farms, namely Crescent Park, Marshlands, Pindi Park, Natalia, Portelet, Veradale, Dunedin C, Luchabi, Grays Block and Vlakfontein, but complete success was achieved only on Pindi Park and Veradale. The latter was a farm associated with the outbreak of Theileriosis on Argyle Park. At the time of the isolation attempts all cattle had been removed and through the courtesy of the owner the affected paddock was made available for the Theileriosis studies.

The isolations were attempted by transmission through *Rhipicephalus appendiculatus* ticks by the following methods:

(*a*) Removal of recently attached infected ticks from sick animals.
(*b*) Feeding of laboratory reared clean ticks on sick animals.
(*c*) Collection of ticks by blanket drag from infected pastures.

These ticks or their subsequent instars were then fed on cattle which had been reared free of tick borne diseases either in the Salisbury or Onderstepoort laboratories. Isolate R 1 was obtained by method (*a*), R 2 by method (*b*), while the remaining isolates were obtained by method (*c*).

Table 5 summarizes the data obtained during the isolation of the Theileria strains.

TABLE 5.—THEILERIA ISOLATIONS

Isolate	*Farm*	*Tick numbers (approx.)*	*Bovine*	*Toxicosis observed*	*Theileriosis observed*	*Severity of illness*
R 1	Pindi Park	30	Weaner 374	—	+	Moderate
R 2	Pindi Park	20	Calf 3991	—	+	Mild
R 3	Veradale	400	Weaner 381	+	+	Died
R 4	Veradale	400	Weaner 382	+	+	Died
R 5	Veradale	4	Weaner 727	—	+	Mild
R 6	Veradale	40	Weaner 739	+	+	Moderate
R 7	Veradale	400	Weaner 740	+	+	Severe
R 8	Veradale	5	Calf 3338	—	+	Mild
R 9	Veradale	15	Calf 3319	—	+	Mild
R 10	Veradale	10	Calf 3587	—	+	Mild

Bovine 3991 was splenectomized.

Table 6 summarizes the data from the experimentally produced Theileriosis cases for comparison with the data collected from the Theileriosis cases in the field recorded in Table 4. In each case only the highest count of parasites recorded has been given for each animal.

TABLE 6.—THEILERIOSIS SPECIMENS

Isolate	*Bovine*	*Specimens*			*Schizonts per 1,000 lymphocytes*	*Piros per 1,000 erythrocytes*
		Blood	*Gland*	*Spleen*		
R 1	374	+	+	—	73	4
R 2	3991	+	+	—	30	11
R 3	381	+	+	+	108	1
R 4	382	+	+	+	690	1
R 5	727	+	+	—	0	0
R 6	739	+	+	—	0	1
R 7	740	+	+	—	24	1
R 8	3338	+	+	—	7	1
R 9	3319	+	+	—	10	1
R10	3587	+	+	—	5	1

By means of ticks isolation R 1 was transmitted from bovine 374 to bovine 3524 (splenectomized) resulting in a mild reaction, with the presence of both schizonts and piros. Clean ticks were fed on bovine 3524, infected with isolate R 1 and these ticks were subsequently used to challenge recovered bovines 3338 and 3587 respectively infected with isolates R 8 and R 10. No reactions were experienced and this indicates that isolates R 1, R 8 and R 10 were similar.

Finally isolate R 9 in bovine 3319, was challenged with *Theileria parva* (East Coast Fever) at Onderstepoort. This animal went through a typical East Coast Fever reaction, culminating in death, showing that R 9 isolate was not related to either *T. parva* or *T. lawrencei*. (There is a cross immunity between *T. parva* and *T. lawrencei*.)

By means of blood the transmissions listed in Table 7 were achieved.

TABLE 7.—THEILERIOSIS TRANSMISSION BY BLOOD INOCULATION

Isolate	*Donor bovine*	*Recipient bovine*	*Result*
R 1	374	664	Piros appeared after 84 days
R 1	374	348	Piros appeared after 78 days
R 1	374	370	Piros appeared after 80 days
R 1	3524	3883	Piros appeared after 54 days
R 2	3991	3458	No result yet
R 3	381	388	Schizonts appeared after 18 days Piros appeared after 104 days
R 4	382	742	No result yet

Bovines 3883 and 3458 were splenectomized.

From the laboratory studies of the parasite counts in Table 6 it is concluded that there is no evidence of *Theileria parva* and this was confirmed by a single cross immunity test. On account of the readiness with which piros were produced in intact animals and the ease with which the *Theileria* was transmitted by

blood inoculation *Theileria lawrencei* is also eliminated. The mild behaviour of the parasite suggests *Theileria mutans* and this is consistent with the fact that fatal Theileriosis cases were produced solely where large numbers of ticks were used for the challenge and where tick toxicosis was concurrently present.

Thus from the first season's work it is concluded that:

(*a*) *Theileria parva* (East Coast Fever) is not present in Rhodesia.

(*b*) *Theileria lawrencei* (Buffalo disease) is not responsible for the widespread occurrence of Theileriosis in Rhodesia. The disease may, however, be present in certain of the well-known buffalo localities which have not yet been studied.

(*c*) *Theileria mutans*, aggravated by tick toxicosis, is the apparent cause of the Theileriosis in the Sinoia district. This syndrome is what is known to the farmers as January disease and differs completely from Buffalo disease. It is likely that January disease is the principal cause in the remaining "non-buffalo" Theileriosis areas but this will need to be confirmed by the isolations of the Theileria responsible.

Anaplasmosis

Production of Anaplasmosis vaccine, *Anaplasma centrale*, has continued smoothly. Two tests of the immunity of *Anaplasma centrale* premune animals against a field strain of *Anaplasma marginale* from Pindi Park confirmed the continued efficacy of the vaccine.

Anaplasmosis is the commonest tick-borne disease in Rhodesia, a position it should hardly merit in view of the excellent vaccine.

Tests were commenced on the Anatest of Diamond Laboratories, but these have not yet reached a stage where conclusions can be drawn.

Babesiosis

The Babesiosis vaccine is bivalent, comprising Anaplasmosis (*Anaplasma centrale*) as well as Babesiosis (*Babesia bigemina*).

Difficulties were experienced when the strain of *Babesia bigemina* passage with larger inocula became necessary in order to restore a satisfactory level of parasitaemia. This vaccine has the decided disadvantage that premunity may last only as little as three months.

Babesia bovis is known to occur in the Eastern Districts of Rhodesia but there has been no call for a vaccine.

CATTLE PRODUCTION IN AFRICAN AREAS

With the secondment of Mr. Chavunduka to the laboratory the opportunity presented itself to investigate cattle production in the African areas, both in the Purchase Areas and Tribal Trust lands. When it is realized that out of a total cattle population of 3,800,000 cattle in Rhodesia some 2,200,000 are found in the African areas, the importance of such a survey is self evident. In the Purchase Areas—where approximately 7,000 African farmers operate—the cattle are run more or less as separately owned and controlled herds usually in fenced lands but having in many cases a dip common to several farmers; but in the Tribal Trust lands, animals, although they may be kraaled separately at night, are run together during the daytime on common grazing grounds.

It is considered that the investigation should take the form of a survey in selected areas into fertility, disease losses, including internal parasites, and that a comparison be attempted by vaccinating and dosing for parasites cattle in selected areas.

INFERTILITY IN RANCH CATTLE

Work undertaken on this problem at Charter Ranch during the year consisted mainly of a comparison of methods of improving conception rates.

The animals used were for the most part either Afrikander or Hereford × Africander and divided into groups of comparable age and size and put in comparable paddocks.

Group G consisted of 89 in calf rising three year old Hereford × Afrikander heifers and received no supplementary feed.

Group H consisted of 42 similar-type animals and were fed 5 lb. daily on a meal based on citrus by-products for 60 days from 15th December, 1964, to 12th February, 1965.

Group K consisted of 39 rising four year old Afrikander-type ranch heifers and received 5 lb. daily of a meal based on sugar by-products for 50 days from 28th December, 1964, to 16th February, 1965.

Calving took place in October–November, 1964, and all groups were subsequently divided into early weaned—at three months—and normal weaned at six months. Early weaning took place on 11th February, 1965, and normal weaning on 12th May, 1965.

The bulls were run with the cows from 17th December, 1964, for a period of 86 days until 13th March, 1965. Table 1 shows the results of the pregnancy checks undertaken on 26th May, 1965, while Table 2 records the calf weights.

TABLE 1.—RECONCEPTIONS IN FED AND NON-FED, EARLY WEANED AND NORMAL WEANED RANCH COWS

Group	*Treatment*	*Age of cow at calving*	*Weaning date*	*Number of cows*	*Number of calf*	*Percentage reconception*	*Gain from E/W*	*Gain from feeding*
G n/w	Non-fed	3 years	Normal	64	33	51	—	—
G e/w	Non-fed	3 years	Early	25	21	84	33%	—
H n/w	Fed	3 years	Normal	24	16	66	—	15%
H e/w	Fed	3 years	Early	24	22	91	15%	—
K n/w	Fed	4 years	Normal	19	10	52	—	n/a
K e/w	Fed	4 years	Early	23	20	87	35%	—

It will be seen that the increases due to early weaning are 35 per cent., 25 per cent. and 35 per cent. while the increase due to supplementary feeding is 15 per cent.

TABLE 2.—CALF WEIGHTS—EARLY AND NORMAL WEANED, FROM SUMMER SUPPLEMENTED AND NON-SUPPLEMENTED COWS

Group	*Cow treatment*	*Age of cows*	*Early weaned* 20/2/66	12/5/66	*Gain*	*Fed over non-fed*	*Normal weaned* 20/2/66	12/5/66	*Gain*	*Fed over non-fed*	*Advantage n/w over e/w*
G n/w	Non-fed	3	—	—	—	—	256	300	44	—	Nil
G e/w	Non-fed	3	256	300	44	—	—	—	—	—	—
H n/w	Fed	3	—	—	—	—	280	352	72	+28	+36
H e/w	Fed	3	250	316	36	—8	—	—	—	—	—
K n/w	Fed	4	—	—	—	—	266	357	91	n/a	+59
K e/w	Fed	4	266	298	32	n/a	—	—	—	—	—

The above table shows the weight increases recorded by normal compared with early weaned calves and the effect on the calf weight of supplementing the mother compared with non supplementation.

ARTIFICIAL INSEMINATION

The problem of A.I. in beef herds is being investigated by the department. Under our normal ranching conditions an extended breeding season of some twelve weeks makes any attempt at A.I. in beef cows a long drawn out and expensive procedure.

There are three categories of animal to be considered:

(*a*) First service heifers which could be expected to give a good conception rate.

(*b*) Dry cows, which again should return a high rate.

(*c*) Cows with calves at foot which we know from experience give a very poor conception rate.

Previous work on early weaning of calves at plus or minus 80 days resulted in a considerably increased conception rate in a relatively short period—in one small group of cows heats commenced three days after weaning and by 14 days all were in calf. However, since this was by natural service, it was felt a trial using A.I. was necessary. During the year an opportunity occurred to assist Cattle Breeder Services in an A.I. trial they were running in conjunction with a local farmer where 173 heifers and 38 early weaned cows were scheduled to be inseminated.

Two bulls were vasectomized and run with the herd in order to ensure that the heifers were stimulated to come into heat.

These animals were inseminated over a period of two months from 12th November onwards, and a total of 172 heifers and 37 cows were inseminated.

Final pregnancy checks showed a conception rate of 76 per cent. in the heifers and 78 per cent. in the early weaned cows.

INFECTIOUS BRONCHITIS TRIAL, MATOPOS

This trial was designed to show how long the IB virus does survive in an infected flock. One month after artificial infection of a young flock clean birds were introduced into this flock and kept for 30 days, at the end of which they were tested serologically for the presence of antibodies. These challenges were repeated at monthly intervals for six months. No transmission of IB to the challenge birds took place.

Population Pathology Trial, Chinamora

Three hundred day-old chicks were handed out to Africans in the Chinamora T.T.L. with the obligation to return all mortalities for the first three months. Fourteen birds were actually returned, but at the end of three months only 46 survivors were found. Lack of co-operation was found to be caused by misunderstanding and political disturbances, which occurred in this area just at the time concerned.

The results so far obtained indicate that malnutrition seems to be the most important problem in growing chicks under T.T.L. conditions. It has been decided to repeat this trial with the co-operation of Mr. Chavunduka, who is conducting a cattle production survey in this area.

Aegyptianella Pullorum

Intensive studies of this parasite and of the disease caused by it have been and are being carried out. About 90 chickens were infected with the parasite in different passages and trials. A paper, "The low-temperature freezing of *Aegyptianella pullorum* in liquid nitrogen with some notes on the experimental infection in the chicken", resulting from these trials has been submitted for publication. Among the future objectives are the investigation of the development of the parasite in the tick host, *Argas persicus*.

WILD LIFE RESEARCH

Considerable development of this unit took place during the year. Mr. A. W. Smith was appointed as a research officer mainly to investigate small wild life and the possibility of disease reservoirs existing there. It was intended to build up colonies of various species which could be tested for susceptibility to various diseases, once a survey had shown the presence of indicative antibodies.

Two teams of African collectors had been formed, one in the Sabi Valley area and one in the Lusulu area, both headed by a European supervisor. The immediate duty of these teams was to take advantage of the selective game destruction project commenced by Tsetse and Trypanosomiasis Control in October, 1964, so that the maximum information about the disease situation in game could be obtained.

During the period under review the following specimens were collected and forwarded to the laboratory by these teams: serum samples, 426; liver specimens, 189; spleens, 100; internal parasites, 602.

These have been obtained from a very wide variety of game although the majority originate from bushbuck, kudu, bush pig and wart-hog, which are the prescribed species.

At the laboratory, spleen specimens from bush pigs and wart-hog are examined for the presence of African Swine Fever using the buffy coat tissue culture technique. Forty-three of the 100 specimens have been examined, all of which proved negative to date.

Out of 426 sera tested for *Brucella* agglutinins one buffalo was strongly positive while two kudu were doubtful.

A total of 421 blood sera from 25 species of game were sent to the Animal Virus Research Institute, Pirbright, and the 269 results returned up to date showed Foot and Mouth disease complement fixing antibodies in 40 samples, i.e. 24 buffalo, four impala, three kudu, two sable, two roan, three wart-hog, one reed buck and one duiker, almost without exception these originate from Glossina infested cattle-free regions. Serum samples are also being forwarded to the Central Veterinary Laboratory, Weybridge, to the Serum Laboratories, Johannesburg, and the Veterinary Research Laboratory, Onderstepoort.

Liver specimens from animals and birds in the Chipinda district—174 in all—are being collected with a view to examination for dieldrin content since this area has been the subject of a spraying campaign for tsetse control. A search by an ornithologist in an area over 200 acres which had recently been sprayed failed to reveal any evidence of abnormal wild life mortality.

Part of the Lusulu Tsetse and Trypanosomiasis Research Station is being developed as a wild life research station with the stationing of a member of this unit there and by the building of suitable pens for the rearing of young wild animals.

Parasites in Wild Animals

One thousand one hundred and ninety parasite specimens from 602 individual wild animals of 39 species were collected. Only a few identifications have been made. Below are some comments on the collection.

Nematodes

Filarial worms were collected from kudu, impala, duiker, steenbuck, eland, reedbuck, bushbuck, sable, zebra and buffalo.

Thelazia sp. have so far only been seen in kudu and bushbuck, incidence is as follows:

Chipinda—in three out of 11 kudu, two out of four bushbuck.

Sebungwe—five out of 22 kudu, two out of three bushbuck.

Cordophilus sagittus is very common in the heart and pulmonary vessels of kudu and bushbuck in all areas.

Trematodes

Fasciola gigantica is rare. This is unusual as there is a high incidence in Rhodesian cattle. Most game examined have originated from areas where there are no cattle.

Amphistomes were collected from hippo, kudu, impala, tsessebe, waterbuck, roan and wildebeest.

Cestode cysts are very common in the musculature of steenbuck, grysbuck and duiker, particularly in the Chipinda Pools area. They have also been collected from impala, kudu, bushbuck and wildebeest. In steenbuck they are to be found more commonly in the hind legs than in the fore leg muscle.

External parasites

Lice infestation was found in wart-hog, buffalo, impala and wild pig. A high incidence of heavy infestation is seen in wart-hog.

Ked (*Melophagus* sp.)—kudu and bushbuck are commonly affected.

An investigation into losses in impala in the Shobi Block showed the cause to be *Sarcoptic mange*.

HIGH-ENERGY FEEDING OF CATTLE

Considerable increase in this type of feeding occurred during the year and several cases were reported of cattle affected with enteritis at the commencement of the feeding. Most of these, it was considered, were due to the failure to provide a change-over period. Some foot-rot was reported but these mostly yielded to the usual treatment and owners of large units were advised to instal foot baths.

When indigenous types such as pure Afrikander or pure Mashona were used considerable evidence of laminitis was seen especially in the latter stages with a very extensive growth of sole becoming apparent so that the animals were in many cases only able to stand erect with difficulty and only obtained relief when taken off this type of feed.

Investigation into a sudden death resulted in the isolation of a *Cl. welchii* type organism—but no action was taken since no further casualties had occurred. (It is understood that such infections are frequent in high-energy feed lots in Canada and America where vaccination of all animals entering feed lots is practised.)

An increase in liver abscesses in high-energy feed bullocks was reported from the Cold Storage and a survey over a period corroborated this. Cultures usually proved these to be sterile. No kidney necrosis has yet been reported.

F.A.O. TICK ECOLOGY PROJECT

During the year this mission was augmented by the addition in December, 1964, of Dr. K. Jooste as taxonomist—this has assisted Dr. MacLeod's task greatly by enabling the vast backlog of tick collections to be dealt with.

The first phase of the project—that of the tick population in the field, its association with host numbers, both cattle and game, climatic environment, etc., is now drawing to a close and preparations have been laid for the laboratory phase to commence. Tick-proof stabling has been erected, provision of large and small animals made, and laboratory equipment for tick rearing has been supplied.

Artificial Insemination (Field Staff)

An insemination service continued to operate with field personnel at Bulawayo and Gwelo.

	Cows inseminated		*Doses sold*		*Mileage per insemination*	
	1964–65	1963–64	1964–65	1963–64	1964–65	1963–64
Bulawayo	1,225	1,313	1,202	794	21·4	19·2
Gwelo	686	825	290	325	16	13·6

Conception Rates for Bulawayo

July–September, 1964	*October–December*, 1964	*January–March*, 1965	*April–June*, 1965
81%	71%	74%	75%

Gwelo: 1963–64, 73%; 1964–65, 78·3%.

All semen used was from the Transvaal A.I. Co-op. The introduction of a price increase from 27s. 6d. per insemination to £2 as from the first of October, 1965, is expected to result in a lower demand for the Inseminator's services. Semen for the Friesland, Jersey, Charolais and Brahman breeds is supplied.

ACKNOWLEDGEMENTS

The active and enthusiastic co-operation of many of the other Government departments in our operations is gratefully acknowledged.

Staff have, under the most discouraging and frustrating conditions, still effectively discharged their duties most efficiently and painstakingly thereby enabling the past history of satisfactory control of disease and maintenance of health in the National Herd to be preserved.

The ready acceptance of our animal products in importing countries is a reflection of their recognized worth.

Their loyalty and application is worthy of the country's gratitude as well as my own.

T. LEES MAY

Director of Veterinary Services.

STATISTICS (FIELD BRANCH)

Smears Examined

Trypanosomiasis	3,954
Anaplasmosis	250
Redwater	144
Theileriosis	83
Quarter Evil	49
Anaemia only	35
Biliary in dogs	21
Biliary in horses	2
Anthrax	5
Spirochaetosis	4
Heartwater	4
Putrid	134
Unsuitable	122
N.P.S.	48,476
	53,283

Post Mortems at District Offices

Cattle	179
Sheep	241
Pigs	110
Goats	6
Dogs	28
Cats	1
Rabbits	1
Buck	1
Poultry	520
	1,087

Faeces Samples: 2,457

IMPORTS AND EXPORTS

Imports	*S.A.*	*S.W.A.*	*U.K.*	*U.S.A.*	*B.P.*	*Zambia*
Bulls	72	—	4	3	—	1
Cows	55	—	—	7	—	—
Heifers	100	12	2	3	—	—
Calves	—	—	—	1	—	—
Oxen	—	—	—	—	726	—
Mixed	—	—	—	—	7,308	230
Mares	78	—	—	—	1	12
Stallions	36	—	—	—	—	1
Geldings	235	—	—	—	2	7
Mules	46	—	—	—	—	—
Sheep	947	—	—	—	3,658	—
Goats	47	—	—	—	1,147	—
Pigs	2	—	—	—	79	—
Totals	1,618	12	6	14	12,921	251

Exports	*S.A.*	*Zambia*	*P.E.A.*	*Congo*	*B.P.*	*Uganda*	*Malawi*
Bulls	7	42	8	—	12	—	4
Cows	77	—	27	—	—	—	—
Heifers	16	—	200	—	—	—	—
Calves	—	—	7	—	—	—	—
Oxen	—	—	7	—	—	—	—
Mixed	—	54	10	—	11	—	—
Mares	23	8	—	—	—	—	—
Stallions	22	1	—	—	—	—	—
Geldings	79	110	11	1	—	—	4
Sheep	—	121	—	—	—	—	—
Goats	—	60	—	—	—	70	—
Pigs	—	62	6	—	—	—	—
Totals	224	458	276	1	23	70	8

CATTLE CENSUS AND DIPPING TANKS

District	*European*	*African*	*Total*	*Dip tanks*	*Power sprays*	*Hand*	*Total*
Salisbury	427,483	411,457	838,940	1,461	526	353	2,340
Bulawayo	358,274	405,525	763,799	1,061	76	155	1,292
Victoria	202,446	492,243	694,689	778	54	—	832
Gwelo	305,240	342,211	647,451	1,008	88	40	1,136
Umtali	73,378	172,956	246,334	445	71	80	596
Chipinga	54,958	62,677	117,635	238	15	13	266
Gwanda	102,591	256,020	358,611	390	18	—	408
Sinoia	132,592	57,946	190,538	402	115	145	662
TOTALS	1,656,962	2,201,035	3,857,997	5,783	963	786	7,532
1963–64	1,626,762	2,225,273	3,852,035	5,661	870	832	7,363
Difference	+30,200	−24,238	+5,962	+122	+93	−46	+169

CENSUS OF OTHER ANIMALS

	Pigs	*Sheep*	*Goats*	*Equines*
Salisbury	46,301	97,300	30,253	8,598
Bulawayo	20,256	92,365	242,972	31,178
Victoria	12,800	56,257	95,086	13,143
Gwelo	6,454	50,468	60,791	14,351
Umtali	7,789	22,658	30,227	1,501
Chipinga	4,019	18,069	44,430	7,108
Gwanda	3,458	49,717	117,088	19,192
Sinoia	6,293	21,007	10,667	2,727
	101,370	407,841	413,514	97,798
1963–64	95,532	384,854	562,606	96,619
Difference	+5,838	+22,987	−149,092	+1,179

PUBLICATIONS

The following is a list of the publications by staff during the current year:

Carr, W. R., Condy, J. B., and Burrows, P. M. *Transferrin Polymorphism of Indigenous cattle in Rhodesia and Nyasaland* (in press).

Condy, J. B., and Hanham, D. *Observations on the infestation of sheep by nematodes in the high rainfall region of Rhodesia* (in press).

Huchzermeyer, F. W. *Low temperature freezing of Aegyptianella pullorum in liquid nitrogen with some notes on the experimental infection in the chicken* (in press).

Matson, B. A. *Control of Anaplasmosis, Babesisis and Theileriosis in Rhodesia* (in press).

Lawrence, J. A. *Intercapsular renal hygroma in pigs.* Vet. Record, Vol. 77, No. 40.